KIEN5000 Industrial Ethernet Switch
User's Manual

KYLAND Telecom Technology Co., Ltd.

KIEN5000 Industrial Ethernet Switch

User's Manual

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Preface

KIEN5000 is a high-performance network-managed industrial Ethernet switch specially designed by KYLAND Telecom Technology CO., LTD. for industrial applications. Its high-performance switch engine, solid and closed case design, high-efficient single-rib shape case heat dispersion surface without fans, overcurrent, overvoltage and EMC protection at power input side, and excellent EMC protection of RJ45 port allows KIEN5000 applicable in harsh and dangerous industrial environments. The redundant function of optical fiber network, independent entire network management channel, redundant power input function, and powerful entire network real-time management system provides multiplex guarantee for reliable operation of the system.

The User's Manual for KIEN5000 Industrial Ethernet Switch mainly introduces the information on technical principles, performance indexes, installation and commissioning, network management etc. to provide users with references in startup, expansion and routine maintenance. It is a practical teaching material that can be used by users in trainings and helps the relevant technical personnel to increase their knowledge and understanding of KIEN5000 industrial Ethernet switch.

This manual mainly includes the following contents:

Chapter 1 introduces general description and system features of KIEN5000 industrial Ethernet switch;

Chapter 2 introduces performance indexes and service functions of KIEN5000 industrial Ethernet switch;

Chapter 3 introduces hardware structure of KIEN5000 industrial Ethernet switch;

Chapter 4 introduces mounting process of KIEN5000 industrial Ethernet switch;

Chapter 5 introduces network management of KIEN5000 industrial Ethernet switch;

Chapter 6 introduces local management of KIEN5000 industrial Ethernet switch;

Chapter 7 introduces field test methods for KIEN5000 industrial Ethernet switch;

Chapter 8 introduces network-forming modes and system configuration of KIEN5000 industrial Ethernet switch;

Appendix A introduces twisted pair and pin distribution rules of KIEN5000 industrial Ethernet switch;

Appendix B introduces cable types and specifications of KIEN5000 industrial Ethernet switch;

Appendix C introduces abbreviations used in this manful.

Statement: as product and technology upgrades and improves constantly, the contents of this document may not completely accord with the actual product. For product upgrading information, please access our company’s website or directly contact with our company’s business representative.

Notice for Safety Operation

This product offers reliable performances as long as it is used within the designed scope. Artificial damage or destruction of the equipment should be avoided.

- Carefully read this manual and well preserve this manual for future reference;
- Do not place the equipments near water sources or damp places;
- Do not place anything on power cable which should be placed in unreachable places;
- Do not tie or wrap the cable to prevent fire.
- Power connectors and connectors for other equipments should be firmly interconnected and frequently checked.

  In the following cases, please immediately disconnect the power supply and contact with our company:

  1. Water gets into the equipments;
  2. Equipment damage or shell breakage;
  3. Abnormal operation conditions of equipment or the demonstrated performances have changed;
  4. The equipment emits odor, smoke or noise.
- Please keep optical fiber plugs and sockets clean. During operation of equipments, do not stare directly into the cross section of optical fiber;
- Please keep the equipment clean; if necessary, wipe the equipment with soft cotton cloth;
- Do not repair the equipment by yourself, unless it is clearly specified in the manual.

Explanation of Warning Marks:

This manual uses two kinds of noticeable warning signs to arouse special attention of users during operation. The implications of these signs are as follows:

Warning: pay special attention to the notes behind the mark, improper operation will result in serious damage of the switch or injury of operation personnel.

Caution, attention, warning, danger: remind the positions requiring attention during operation.

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Chapter 1 System Overview

1.1 Product Overview

KIEN5000 is a high-performance managed industrial Ethernet switch specially designed by KYLAND Telecom Technology CO., LTD. for industrial applications. Its high-performance exchange engine, solid and closed case design, high-efficient single-rib shape case heat dispersion surface without fans, overcurrent, overvoltage and EMC protection at power input side, and excellent EMC protection of RJ45 port allows KIEN5000 applicable in harsh and dangerous industrial environments. The redundant function of optical fiber network, independent full network management channel, redundant power input function, and powerful full network real-time management system provides multiplex guarantee for reliable operation of the system.

KIEN5000 industrial Ethernet switch provides two mounting ways, DIN rail and wall-mounting. On the front panel, there are four uplink redundant 10Base-T/100Base-TX RJ45 interface. In the event of system failure, the recovery time of the redundant ring network will be less than 300ms. It provides four 10Base-T/100Base-TX RJ45 ports. Each RJ45 port has adaptive function, capable of automatically configuring to 10Base-T or 100Base-TX status and full duplex or half duplex operation mode.

1.2 Features

High-performance Industrial Ethernet Switch

1. 10/100Base-T/TX Ethernet ports, adaptive, full/half duplex
2. High speed redundant ring with recovery time < 300ms
3. Chinese management supports Telnet, SNMP protocol.
4. Supports VLAN to control broadcasting domain and segment flow.
5. Alarm relay output power supply and port link.
6. Broadcast storm control

Powerful Management Function

1. Manage system can be done in web browser or via Telnet.
2. Individual naming for each device in the network.
3. Setting and query of VLAN.
4. Setting and query for alarm of power and ports link.
5. Setting and query for port working mode, prioritization, and rate

Industrial Power

1. Industrial power input of DC24V（DC18V～36V）.
2. Reliable protection for EMC and against over-current/over-voltage.
3. Redundant power input.

Rugged Design

1. Ribbed heat-removal design (fanless); operation at -40℃ to +75℃
2. Solid IP40 housing
3. Easy DIN-Rail mounting or optional wall-mounting

1.3 Packing list and unpacking check

1. Packing list

The packing case includes the following items:

KIEN5000	1 unit
3-core DC power terminal	2 pieces
2-core alarming output terminal	1 piece
User's Manual for KIEN5000 Industrial Ethernet Switch	1 copy
Customer Service Guideline	1 copy

Φ 3 grounding cold pressed terminal, M3 × 8 grounding screw 1 piece each

2. Unpacking check

Before opening the case, place it stably, pay attention to the direction of the packing case, and ensure its right side is facing upward, so as to prevent KIEN5000 from falling apart after opening the case. If a hard

object is used to unclench the case, do not overly extend the hard object into the case to avoid damage of the equipments inside the case.

After opening the case, check the amount of KIEN5000 equipments (including main unit of KIEN5000, parts of equipment, user's manual, customer service guideline) according to the packing list, and check the appearance quality of KIEN5000.

Warning:

For the built-in precise parts of equipments, please handle with care and avoid strenuous vibration to avoid affecting the performances of equipments.

Chapter 2 Performance Indexes

2.1 System indexes

The system performance indexes of KIEN5000 industrial Ethernet switch are shown in Table 2-1.

Table 2-1 System Indexes

System Indexes	KIEN5000
Quantity of RJ45 port	4 ×10Base-T/100Base-TX
Quantity of uplink redundant RJ45 port	4 ×10Base-T/100Base-TX
System parameters	Supporting standard: IEEE802.3, IEEE 802.3x, IEEE 802.3u, IEEE 802.1p, IEEE 802.1Q Store-and-Forward speed: 148810 pps Max. filtering speed: 148810 pps Switching mode: Store-and-Forward Switching bandwidth of system: 5.6G MAC address list:8k Max. VLAN quantity: 4094 Electromagnetic compatibility interference: EN55022 Electromagnetic compatibility immunity: EN50082-2
Ethernet port	Physical port: shielded RJ-45 RJ-45 port: 10Base-T/100Base-TX, supporting automatic negotiation function Port standard: in line with IEEE802.3 standard Transmission distance: <100m
CONSOLE interface	Physical interface: shielded RJ-45 Interface standard: in line with RS232 standard (3 lines) Interface speed: 9600bps
Power supply	Input voltage: double channelDC24V（DC 18V～36V） Input power consumption: <6W Overcurrent protection: built-in
Mechanical parameter	Physical dimensions (height×width×depth): 142 ㎜×55.4 ㎜ ×120.5 ㎜（excluding the dimensions of DIN rail and wall-mounting components） Mounting mode: DIN rail or wall-mounting Heat removal method: Ribbed aluminum casing heat dissipation without fan. Outlet type: front outlet for service, top outlet for power supply and network management

	Shell protection: IP40 Weight: 1 kg
Ambient conditions	Operating temperature: -40℃～75℃ Storage temperature: -45℃～85℃ Humidity: 10%～95% （non-condensing）

2.2 Service Interface

1. Four 10Base-T/100Base-TX RJ45 ports. Each RJ45 port has self adaptation function, capable of automatically configuring to 10Base-T or 100Base-TX state and automatically working in full duplex or half duplex operation mode, supporting automatic MDI/MDI-X connection. The transmission distance is less than 100m.
2. Four uplink redundant 10Base-T/100Base-TX RJ45 interface include two kinds of mode. One is straight-through connection mode act as normal Ethernet interface; another one is redundant ring mode and supports twisted-pair redundancy technology with recovery time less than 300ms.
3. In line with/meeting IEEE802.3/802.3U/802.3X.
4. Meanings of RJ45 port indicator: yellow lamp – speed indicator; on: 100M; off: 10M

   Green lamp – connection state indicator, on: effective connection of network; off: no connection.

2.3 Service function

Configuration and Management

At KIEN5000, the settings, queries and management can be realized for the whole switch or network system through CONSOLE interface, Telnet and Web browner.

LED Indicator

The LEDs indicate the port status correctly including transmission rate, link status and system status.

VLAN

The network can be divided into several VLANs according to ports, through which the users in one VLAN can communicate each other. The VLAN of KIEN5000 conforms to IEEE802.1Q and

can realize the communication within one VLAN of different switches. KIEN5000 supports up to 4094 VLANs based on IEEE802.1Q.

802.1p Prioritization

KIEN5000 conforms to 802.1p, which is used the most widely in LAN environment. The end-users of KIEN5000 can make use of this function to configure the port-based prioritization when 802.1p is not supported at user's end and different priority is necessary for different ports' services. Only the data package without Prioritization in the Packet in the ports can be affected by this function. Each port of KIEN5000 supports 2 levels (high, low) prioritization.

Layer-2 Switching

Switches work in two ways: Cut-Through and Store-and-Forward. In Cut-Through, a data packet is immediately relayed further after detecting the target address; in Store-and-Forward, a data packet is first read-in completely and checked for errors before the switch relays the same. KIEN5000 employs Store-and-Forward that is a switching mode widely used.

IGMP

IGMP means Internet Group Multicast Protocol. KIEN5000 supports IGMP and query.

Setting for Working Mode of Port

KIEN5000 is able to set the working mode of all ports through management: full/half duplex, auto-sensing, enforced full/half duplex, enforced 10M/100M etc.

Broadcast Storm Control

Broadcast storm is the ceaseless transfer of broadcast frame or multicast frame in bridge, which is caused by loop and will waste much bandwidth. The purpose of broadcast storm control is to optimize the performance of switch network. KIEN5000 supports the broadcast storm based on percentage. With the control percentage, the broadcast flow of KIEN5000 will be monitored and controlled effectively. The switch will filter out the over flow and ensure the flow percentage is normal once the bandwidth of broadcast flow exceed the limit.

Alarming

KIEN5000 offers the alarming functions for power, port link and network. Through management software, all the alarming functions can be configured functionally. The alarming information is shown on management interface.

Chapter 3 Hardware Structure

3.1 System structure

The hardware structure of KIEN5000 industrial Ethernet switch is shown in Figure 3-1.

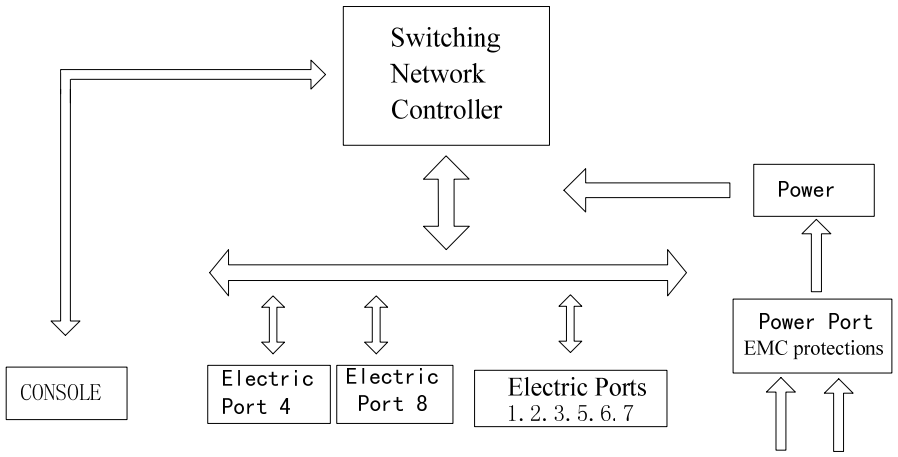


Figure 3-1 Hardware structure

The system hardware mainly consists of:

1. The switch controller uses high-performance ASIC chip technology, and provides two-layer linear speed forwarding of data packet.
2. Industrial power supply with overcurrent, overvoltage and EMC protection is used as the power supply.
3. EMC protection is provided for all electrical interfaces and CONSOLE interface.

3.2 Switch Structure

3.2.1 Case

KIEN5000 case is a small DIN rail or wall mounting type structure. The entire unit has a six-side-enclosed structure, with protection class up to IP30. The case's left and right side plates made of ribbed aluminum profile are a part of the heat dispersion system of the entire unit. The single-rib structure can double heat dissipation area. The heat generated when the unit is working is effectively dissipated into the environment via the ribbed heat-dissipation

surface in the form of radiation and convection greatly increasing the high temperature resistance of equipment. Discarding the traditional form of axial fan heat dispersion reduces power consumption of the entire unit and increases the stability of the system. The figuration of KIEN5000 case is shown in Figure 3-2.

Its contour dimension (excluding the dimensions of DIN rail and wall-mounting components) is 142 ㎜×55.4 ㎜×120.5 ㎜（height×width×thickness）

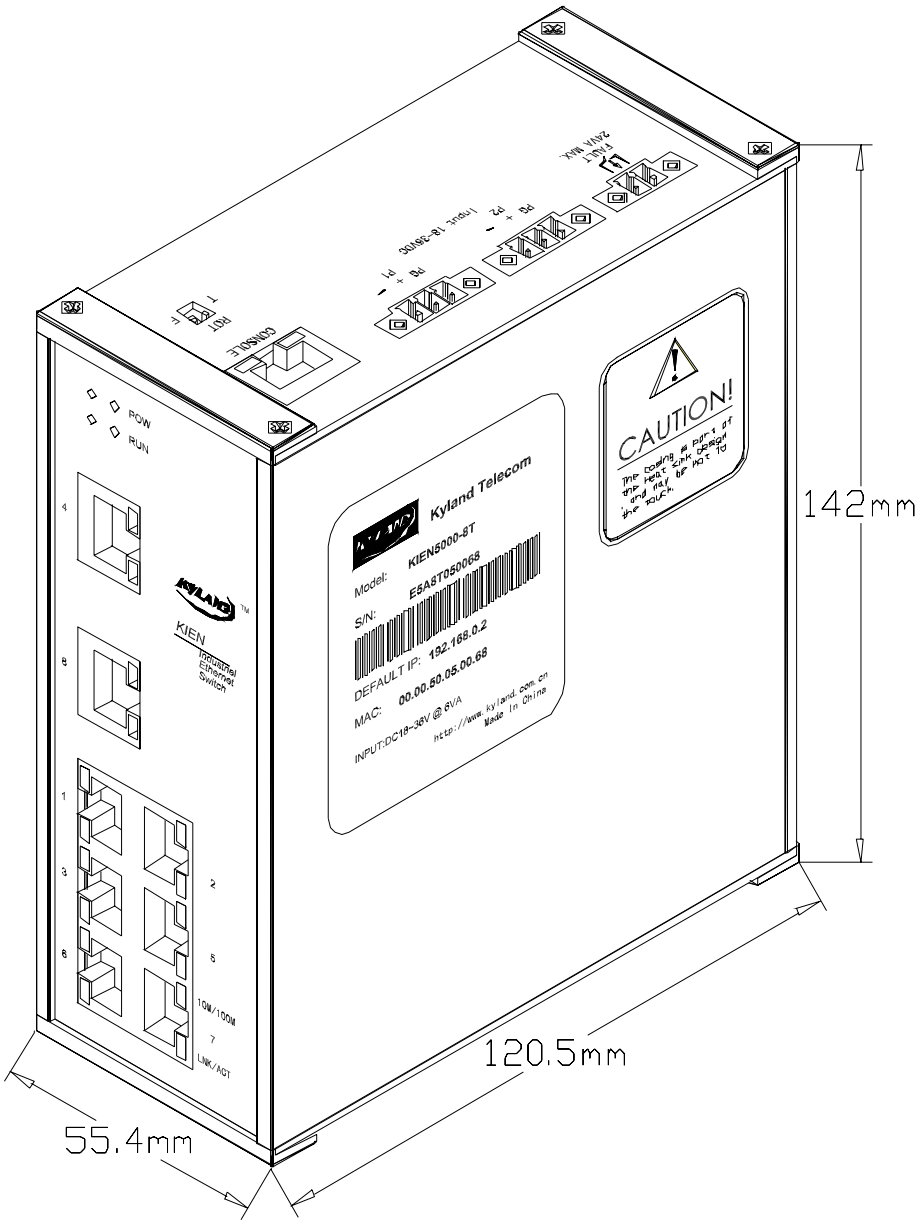


Figure 3-2 Outline drawing of KIEN5000

Warning:

The shell of this switch is a part of the heat dissipation system of the unit. It may get hot during working, so never touch the shell when the equipment is working to avoid burning.

3.2.2 Front panel

The front panel of KIEN5000 industrial Ethernet switch has integrated four 10Base-T/100Base-TX RJ45 Ethernet ports and four system and port operation indicators. Its structure is shown in Figure 3-3:

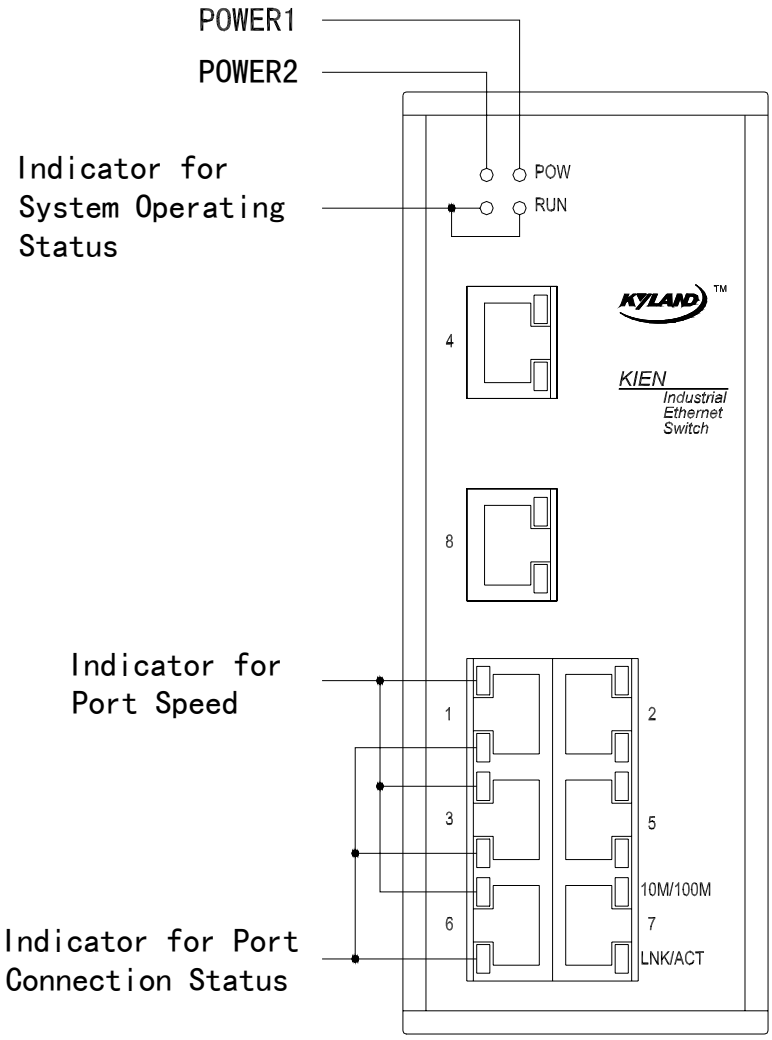


Figure 3-3 Front panel diagram

Uplink redundant Ethernet RJ45 port

KIEN5000 has four uplink redundant 100Base-T/100Base-TX interface, with port number of 1，2 and 4，8（1 and 2 are a pair, 4 and 8 are a pair.）. In the event of the system fault, the recovery time of the redundant ring network is less than 300ms, effectively enhancing the reliability of network operation.

Ethernet RJ45 port

KIEN5000 has four 10Base-T/100Base-TX RJ45 Ethernet ports numbering 3, 5, 6, 7. Each RJ45 port has self-adaptation function. Straight-through cable / cross over cable can be used to connect the switch with end equipments, servers, hubs or other switches. Each port supports IEEE802.3x self-adaptation, so the most suitable transmission mode (half duplex or full duplex) and data rate (10 Mbps or 100Mbps) will be automatically selected (the connected equipment should also support this characteristic). If the equipment connected to these port does not support self-adaptation, the ports will send proper speed but the default transmission mode is half duplex.

LED indicator

The indicators on the front panel of KIEN5000 can indicate system operation and port status, helping detect and eliminate faults. Table 3-1 describes the meanings of all indication lamps on the front panel.

Table 3-1 LED Indicator Descriptions

LED	Condition	State
1、2 port and 4、8 port RUN state LED		
4、8 port RUN	On	The 4、8 interface of the switch is set as redundant mode and the unit is set as central office devices
	Blinking	The 4、8 interface of the switch is set as redundant mode and the unit is set as remote. .
	OFF	The optical fiber interface of the switch is set as common direction connection mode.
1、2 port RUN	On	The 1、2 interface of the switch is set as redundant mode and the unit is set as central office devices
	Blinking	The 1、2 interface of the switch is set as redundant mode and the unit is set as remote.
	Off	The optical fiber interface of the switch is set as common direction connection mode.
Power LED		
POWER 1	ON	POWER 1 is connected and operates normally.

	OFF	POWER 1 is not connected or operates abnormally.
POWER 2	ON	POWER 2 is connected and operates normally.
	OFF	POWER 2 is not connected or operates abnormally.
Ethernet RJ45 port state LED		
Each RJ45 Ethernet port has two indicators, a yellow lamp and a green lamp. The yellow lamp indicates port speed, and the green lamp indicates port link state.		
10M/100M (Yellow lamp)	On	100M working status（i.e. 100Base-TX）
	Off	10M working status (i.e. 10Base-T）
LINK/ACT （green lamp）	On	Effective network connection has been established for the port
	Blinking	Network activities are available at the port
	Off	No effective network connection has been established for the port.

3.2.3 Top panel

The top panel of KIEN5000` industrial Ethernet has integrates two power input terminals for redundant power supply, alarming relay output terminal, RS232 management port, DIP switch for switch attribute setting etc.

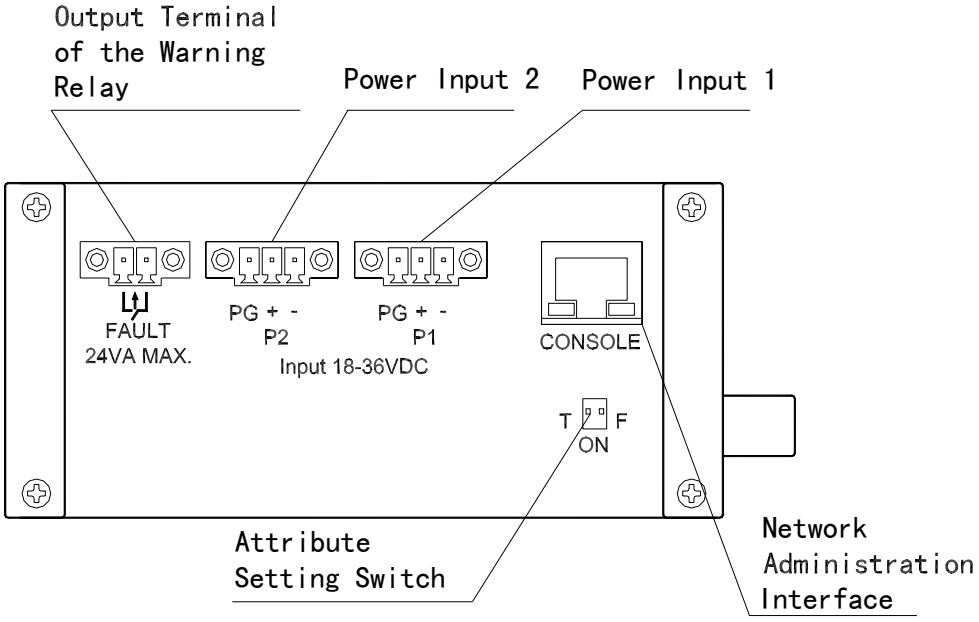


Figure 3-4 Top panel structure diagram

Power input terminal

KIEN5000 has redundant power input function. It has two power input terminals P1 and P2, each allowed to be used singly, or both to be used

simultaneously to input power to KIEN5000 from two independent sets of external DC power supply systems so that when either of the two sets of power supply systems fails, the equipment can operate uninterruptedly, thereby increasing the reliability of network operation. Three-wire terminal with interval of 3.81㎜ is used for power connection. The diameter of power cable is less than 1.5㎜.

Connection sequence is shown in Figure 3-5. Connection and mounting procedures are as follows:

1. Strip 5mm-long sheath from power cable and twist the bare copper wires together into a bundle;
2. Use a 2.5㎜ one-slot screwdriver to unscrew the “power cable locking screw”, insert the power cable into the hole at the terminal tail, and screw down the “power cable locking screw”;
3. Insert the power terminal into the DC power socket of the equipment and use a 2.5mm one-slot screwdriver to screw down the two “terminal locking screws” to firmly connect the terminal with the power connector.。

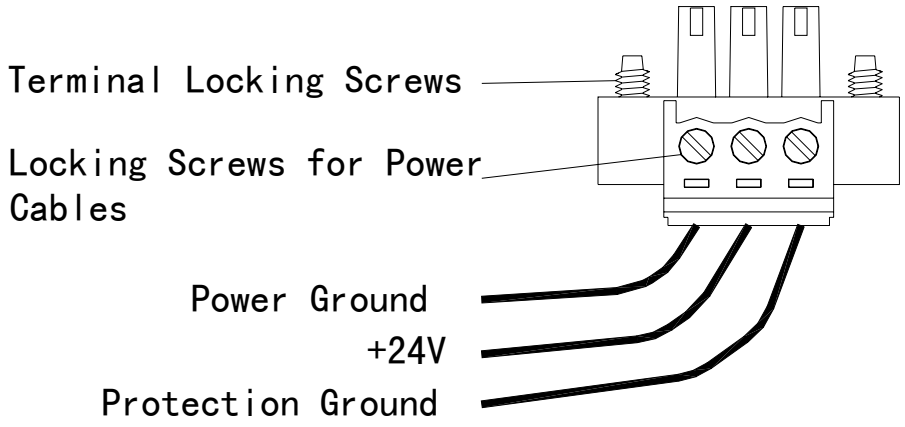


Figure 3-5 Wiring diagram for DC power terminal

Alarming relay output terminal

The terminal is a group of normally open contacts of the alarming relay of equipment. Its figuration is the same as that of power input terminal. Alarming enabling message, such as power failure alarming, port link alarming, network alarming etc., can be set via network management. In normal state without alarming, the terminal is in open state; when any alarming message appears, the terminal is in closed state. It can be externally connected to other switching value collecting equipments or

alarming lamps or alarming buzzers so as to timely prompt the operation personnel in case alarming occurs. The maximum withstand voltage of the relay terminal is DC30V and the maximum input power 24VA. Figure 3-6 is the schematic diagram of the equipment when it is connected an alarming indicator and the wiring method for other applications is similar.

Its wiring and mounting procedures are the same as those of power terminal.

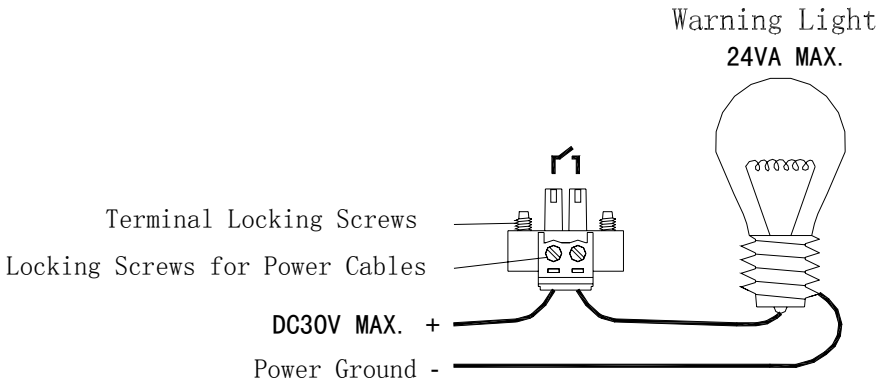


Figure 3-6 External alarming lamp of alarming relay output

Network management interface (CONSOLE)

The network management interface of KIEN5000 is shielded RJ45 connector and its interface communication standard is 3-wire RS232. Users can the network management cable with end bearing RJ plug and another end DB9F plug to connect the network management interface of KIEN5000 with the 9-pin serial port of the control computer. Operating the local management software provided by KYLAND Telecom in the control computer allows configuration, enquiry and management of the KIEN5000 equipment directly connected with the serial port of the control computer. Connection of network management cable with the local terminal network management interface to operate the network management software provided by KYLAND Telecom in the control computer allows to realize the configuration, enquiry and management functions of all KIEN5000 equipments within the entire network

The wiring sequence for network management interface of KIEN5000 and the 9-pin serial port of PC computer is shown in Figure 3-7.

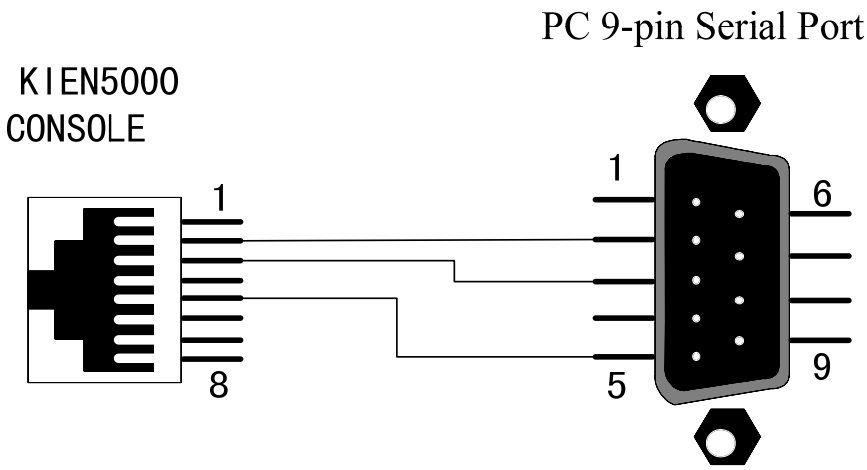
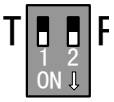
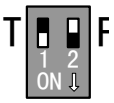
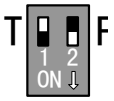
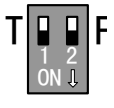


Figure 3-7 KIEN5000 network management wiring diagram

Table 3-2 Corresponding Relations between Specific Positions of DIP Switch and Equipment Attribute

Position of DIP Switch			**Attribute Implication**
Position Sketch	**Logic position**		
	T	OFF	4 、 8 port set as common straight-through connection mode.
	F	OFF	1 、 2 port set as common straight-through connection mode.
	T	OFF	4、8 port set as set as redundant mode remote.
	F	ON	1 、 2 port set as common straight-through connection mode.
	T	ON	4、8 port set as set as set as redundant mode remote
	F	OFF	1、2 port set as set as redundant mode local.
	T	ON	4、8 port set as redundant mode local
	F	ON	1、2 port set as redundant mode local

DIP switch for property setting

The DIP switch for setting of KIEN5000 has two positions, namely T

and F. The corresponding relation between specific positions of DIP switch and equipment setting is shown in Table 3-2.

Attention:

In a redundant ring network, only one end equipment should be set as local, and others as remote.

3.2.4 Bottom panel

There is a threaded hole for grounding in the bottom panel of KIEN5000. M3 ×8 screw and Φ3 cold pressed terminal for grounding free of charge will be delivered together with the main unit. As shown in Figure 3-8, crimp one end of grounding conductor to the cold pressed terminal and then use the grounding screw to fix it at the grounding hole of the shell; reliably connect the other end of grounding conductor to the ground. The diameter of grounding cable should be less than 2mm.

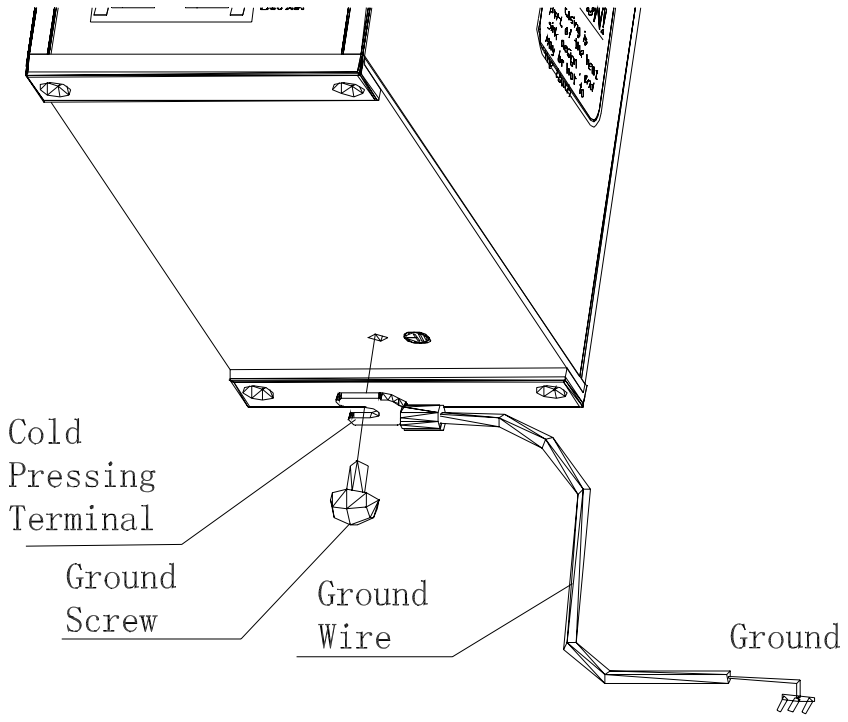


Figure 3-8 Grounding methods for KIEN5000 case

Chapter 4 Hardware Mounting

4.1 Mounting requirements

KIEN5000 industrial Ethernet switch has a single body structure and can be directly mounted on standard 35㎜ DIN rail, or vertically mounted on the wall or inner wall of cabinet with wall-mounting components.

Before mounting KIEN5000, first check whether the working environment meets the mounting requirements, including power supply requirement, adequate space, the distance to other network equipments to be connected and whether other equipments are available. Please ensure that the following mounting requirements are met:

1. Power supply requirement: standard KIEN5000 product uses redundant 24VDC power supply (18VDC～36VDC).
2. Environment requirement: temperature -40℃～75℃, relative humidity 10％～95% (non-condensable).
3. Grounding resistance requirement: <5Ω
4. Check whether cable is laid properly
5. Avoid exposure to exposure to direct sunlight and keep away from heat source or places with strong electromagnetic interference.
6. Standard KIEN5000 product only provides DIN rail mounting components, so users only need to get DIN rail available. If wall-mounting is necessary, users need to purchase additional wall-mounting components. Moreover, users should also get available screws, nuts and tools for wall mounting and ensure the mounting is reliable.
7. Check whether cables and connectors necessary for mounting are available.

4.2 Main unit mounting

4.2.1 Rail mounting

For most industrial applications, standard 35㎜ DIN rail mounting is very convenient. when taken out from the packing box, the rear panel of

KIEN5000 has already fitted with a green plastic connector socket for DIN rail. Rail mounting dimensions are shown in Figure 4-1. If it is necessary to mount KIEN5000 on DIN rail, check the mounting conditions of DIN rail before mounting, including the following two items:

1. Whether DIN rail is firmly fixed, whether any other equipment is fitted DIN rail, whether there is adequate space for mounting KIEN5000.
2. Whether there is power inlet on DIN rail suitable for KIEN5000 operation.

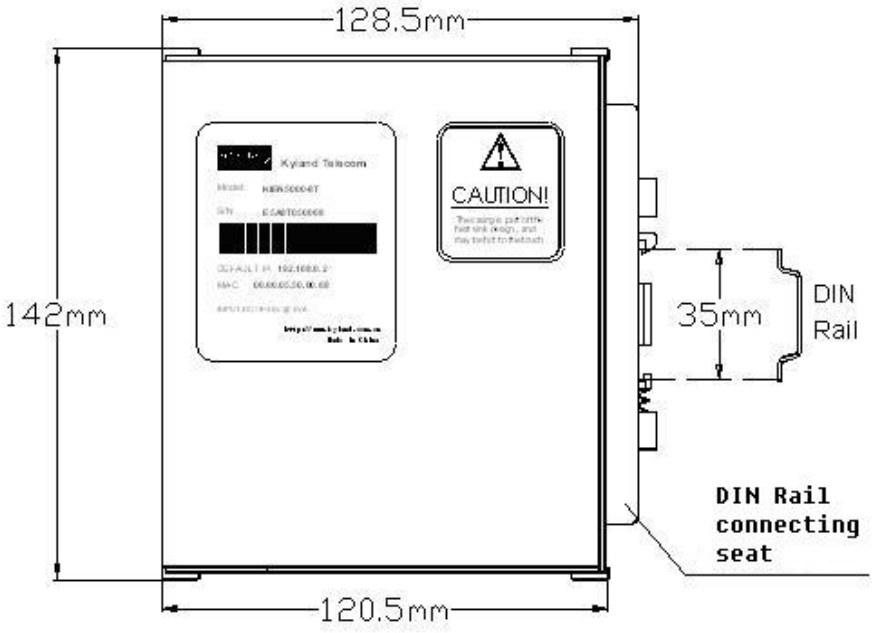
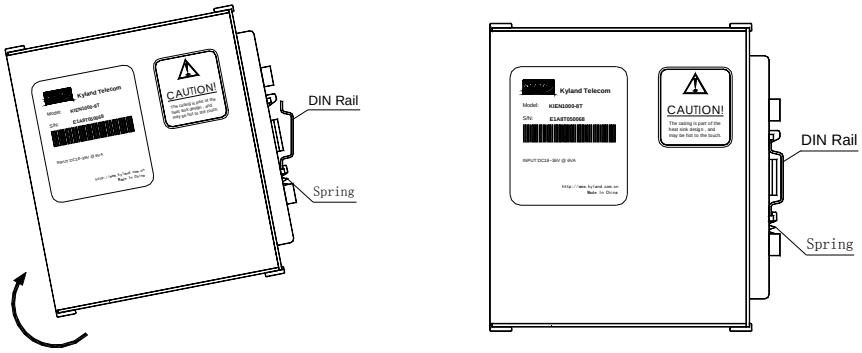


Figure 4-1 Rail mounting dimension of KIEN5000

After selecting the proper position for mounting KIEN5000, mount KIEN5000 on DIN rail according to the following procedures:

1. Insert the lower part of DIN rail into the fixing slot with spring supporting in the lower part of the DIN rail connector socket. Slightly rotate the equipment upwards from bottom panel of KIEN5000 as shown in Figure 4-2 a.
2. As shown in Figure 4-2 b, clip DIN rail into the DIN rail connector socket, and ensure that KIEN5000 equipment has been reliably mounted on DIN rail.



a b

Figure 4-2 Mounting KIEN5000 on DIN rail

4.2.2 Wall-mounting

In some places, wall mounting may be more suitable than DIN rail mounting. KYLAND Telecom can provide the component (wall-mounting plate) for mounting KIEN5000 on wall. Wall-mounting dimensions are shown in Figure 4-3.

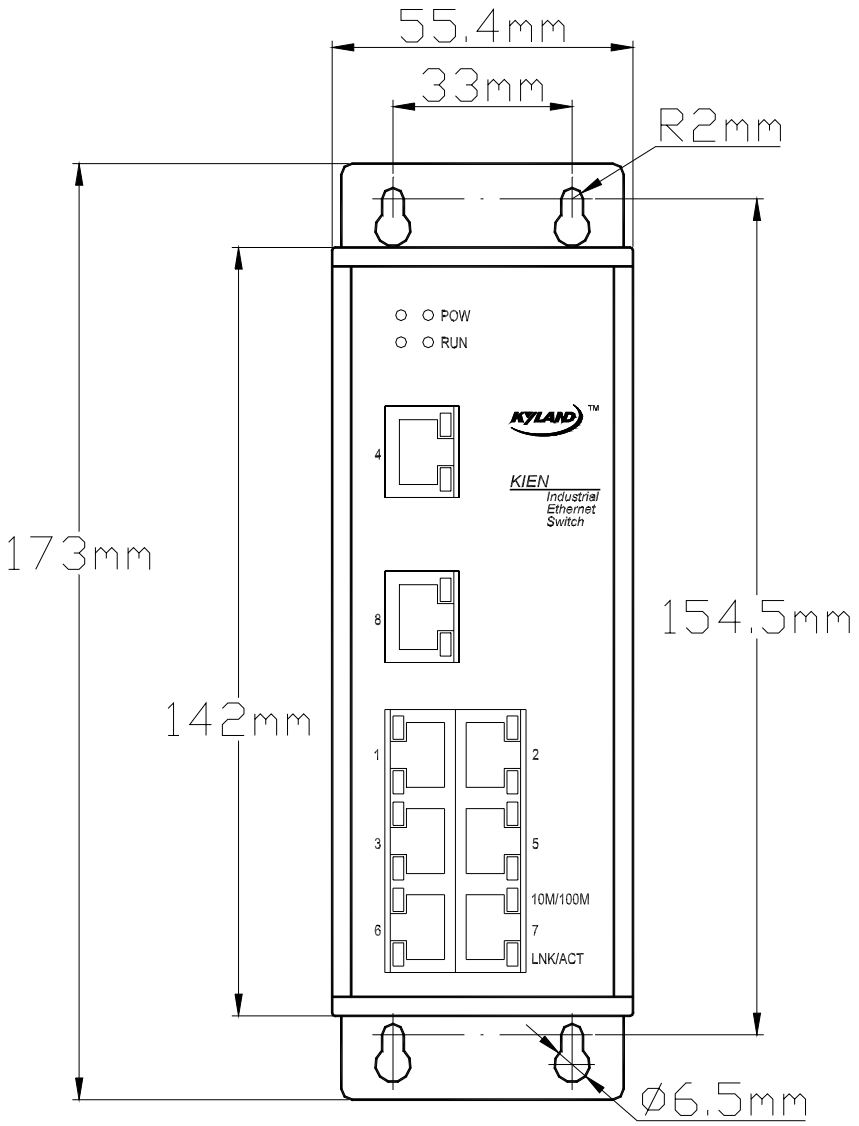


Figure 4-3 KIEN5000 wall-mounting dimensions

Attention:

Wall-mounting plate is not included in standard configuration of KIEN5000. It should be ordered independently when ordering.

Wall-mounting procedures for KIEN5000:

1. Use a cross screwdriver to unscrew the two screws fastening the DIN rail connector socket on KIEN5000 equipment, and remove the green DIN rail connector socket.
2. Take out the wall-mounting plate and the screws (cross recessed

countersunk head screws M3×6) for mounting wall-mounting plate from the packing box. Use a cross head screwdriver to mount the wall-mounting plate in the position originally for mounting DIN rail connector socket. The mounting direction of the wall-mounting plate is shown in Figure 4-4.

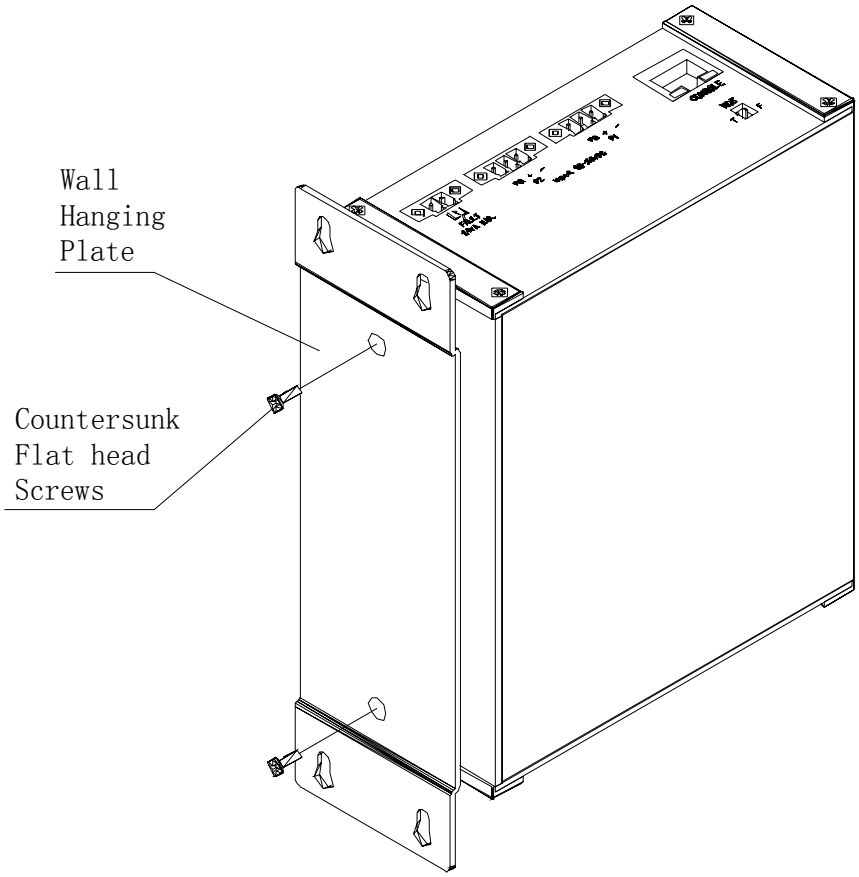


Figure 4-4 Mounting wall-mounting plate

3. Select mounting position: vertical wall or inner wall of cabinet. If you select to mount on vertical wall, you are recommended to use Φ6 plastic expansion bolts and Φ3 tapping screws for equipment mounting. According to the mounting dimensions marked in Figure 4-3, drill four Φ6 holes with an impact drill on the wall (the depth of the holes should allow fully inserting the plastic expansion bolt), fully insert the plastic expansion bolts in the holes on the wall, screw down the tapping screws into the plastic expansion bolts with a cross head screwdriver but do not screw down thoroughly, reserve a distance of around 5 ㎜; if you select to mount on the inner wall of cabinet, you are recommended to prepare four M3 threaded holes on the inner wall of cabinet when making the

cabinet according to the mounting dimensions marked in Figure 4-3, or drill four Φ4 holes with a hand-held electric drill on site, and screw down four M3×10 pan head screws with cross recess into the four holes with a cross head screwdriver (if the holes are not threaded inside, it is necessary to mount four M3 nuts on the back side). Do not screw down the screws thoroughly, reserve a distance of around 5 ㎜.

4. After fastening the screws on the wall, mount KIEN5000 in the selected position. Pass the four screws through the four Φ65 holes on the wall-mounting plate and slip KIEN5000 downwards, as shown in Figure 4-5. Fasten the four screws. KIEN5000 has now been fastened on the wall or inner wall of cabinet.

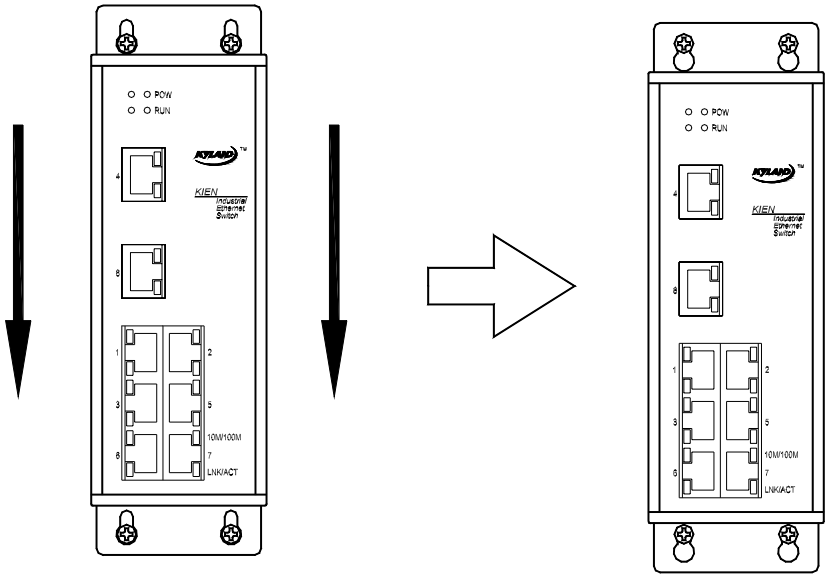


Figure 4-5 Schematic diagram for wall-mounting process

4.3 Cable connection

After properly mounting KIEN5000, it is ready for cable mounting and connection, mainly including cable connection for the following interfaces:

1. Service interface

   KIEN5000 provides 10Base-T/100Base-TX RJ45 Ethernet interface for the connection to end equipments in straight-through way and to network equipments in cross-over way.

2. Network management interface connection

   KIEN5000 is connected with the serial port of control computer via the CONSOLE port of the top panel. Users can make a network management line with proper length according to Figure 3-7.

3. Power connection

   Use 24V DC power supply for KIEN5000 equipment according to the indications on product label. Connect power supply after finishing connection of all other cables.

4.4 Cable wiring

Cable wiring should meet the following requirements:

1. Before cable wiring, check whether the specifications, models and quantities of all cables comply with the construction drawing design and contract requirements.
2. Before cable wiring, it is necessary to check whether there is damaged cable and whether the cables are accompanied by ex-factory records and vouchers attesting their quality such as quality assurance certificate etc.
3. The specifications, quantities, route directions and laying position of the cables to be laid should meet the design requirements of construction drawings. The laying length of each cable should be determined according to its actual position.
4. No intermediate break or joint is allowed for the cables to be laid.
5. User’s cables and power cable should be laid separately.
6. Inside walkways, the cables should be properly arranged in good order, with uniform, smooth and flat turnings.
7. Cables should be straightly laid in cable channels. Extruding of cable from cable channels to block other outlet or inlet holes is not allowed. The cables at the outlet part of cable channel or at turnings should be bundled and fixed.
8. If cables, power line and grounding conductor are laid in the same channel, cables, power line and grounding conductor should be not folded or blended together. If a cable line is overly long, coil and place it in the middle of the cabling rack, do not let it cover on other cables.

9. There must be the relevant marks at both ends of cable and the information on the marks should be explicit to facilitate maintenance.

Chapter 5 Testing Method

5.1 Self-testing process

As soon as the equipment is powered, all the indicator of service ports at the front panel will blink once at the moment, this indicates the operation of the ports is normal, after this, the corresponding POW will keep the light on, the RUN lamp (operation lamp) will keep on light/blink/be off according to the attribute of attribute switch setting.

5.2 Testing of Ethernet interface

Power KIEN5000 as shown in Fig. 5-1, make any two Ethernet interfaces connect with the network port of the two testing computers by straight-through network cable, transmit Ping command mutually, both sides can correctly Ping to each other and no data package is lost. At the same time, the yellow lamp on the corresponding port should keep on (computer network interface card operates in 100M state), or keep off (computer network card operates in 10M state), and the green lamp on the corresponding port should flash. This indicates the tested hardware of the two electrical operates normally. The same testing method will be used to test all the rest Ethernet interfaces (For detailed operation of the Ping command, please refer to the following examples).

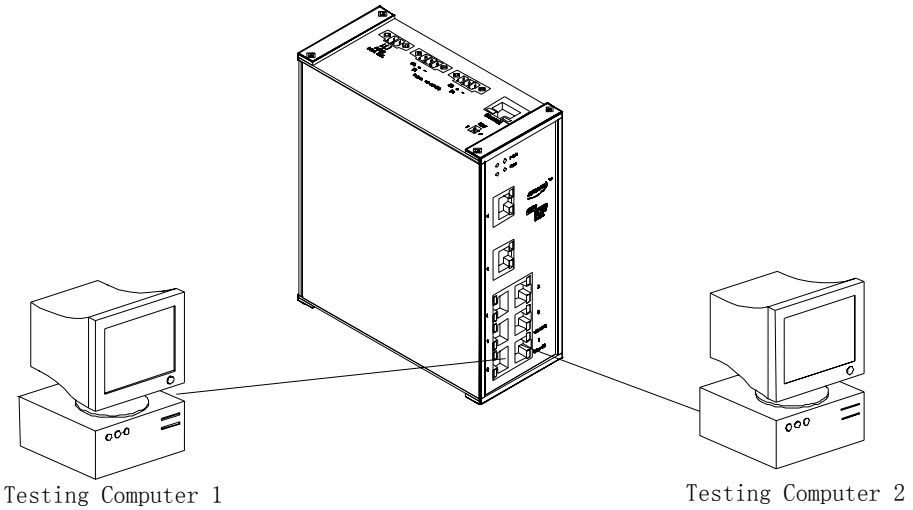


Fig. 5-1 Testing of Ethernet port

5.3 Testing of uplink electrical ports

Let the equipment of KIEN5000 at both ends to form a fiber link network as shown in Fig. 5-2., connect any one Ethernet interface of each equipment to the testing computer by straight-through network cable, transmit Ping command mutually, both sides can correctly Ping to each other and no data package is lost. This indicates the tested hardware of the two electrical operates normally. The same testing method will be used to test the other pair of uplink electrical ports (For detailed operation of the Ping command, please refer to the following examples).

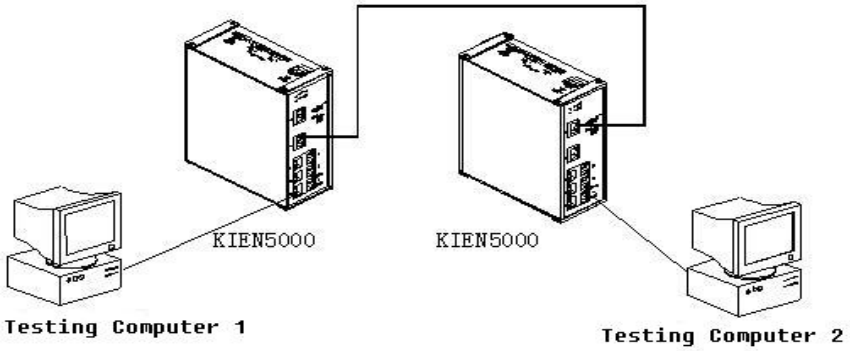


Figure 5-2 Uplink Electrical port testing

Example of PING command:

The IP address of testing computer 1 is 192.168.100.10, and that of the testing computer 2 is 192.168.100.11，operating command in the “Operation” column of the “Starting” menu of the operating testing computer 1 is cmd or command (WIN2000 system uses cmd, WIN98/95 uses command respectively), transmitting ping is 192.168.100.11 –l 1000 –t (–l refers to the number of byte, -t means continuously transmitting data), operating command in the “Operation” column of the “Starting” menu of the operating testing computer 2 is cmd or command (WIN2000 system uses cmd, WIN98/95 uses command respectively), transmitting ping is 192.168.100.10 –l 1000 –t , testing computer 1 replies from 192.168.100.11：bytes=1000 time<10ms TTL=128, testing computer 2 replies from 192.168.100.10：bytes=1000 time<10ms TTL=128. If the lost package rate is 0 based on the statistic by using CTL+C command after the operation is over 10 minutes, this indicates that the operation is normal.

Chapter 6 Networking Mode and System Configuration

6.1 Networking mode

KIEN5000 Industrial Ethernet Switch has 4 10Base-T/100Base-TX RJ45 Ethernet ports, each can provide special link to directly connect end equipment, or connect another industrial Ethernet switch or hub as a common link. KIEN5000 Industrial Ethernet Switch also has 4 100Base-T/100Base-TX Ethernet RJ45 interfaces of uplink redundancy. By using the uplink redundancy RJ45 interface, a twisted-pair redundant ring network can be formed. The recovery time of the ring network redundancy is less than 300ms when the system is in fault. It is widely applied in many fields, such as electric power, transportation, energy, water treatment, automatic control of large factory and office scheduling etc.

The most typical network- forming mode of KIEN5000 is redundant ring network and redundant double ring netowrk. KIEN5000 can form a twisted-pair redundant ring network as shown in Figure 6-1, in which one end unit is set as local one, and the others as remote one. When a twisted-pair disconnection happens at any place, communication can be resumed within 300ms.

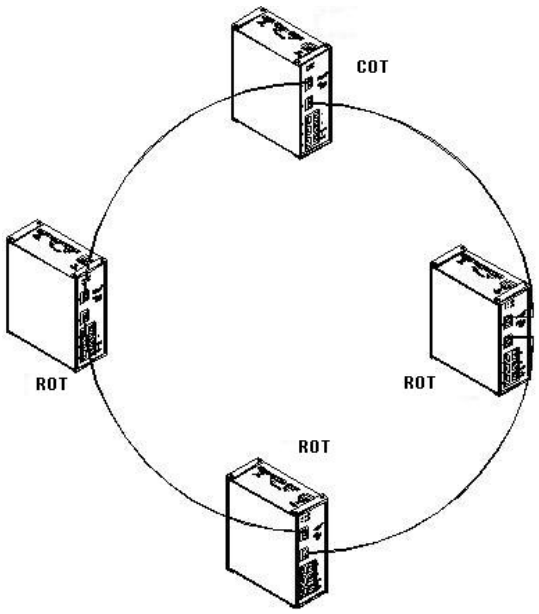


Figure 6-1 twisted-pair redundant ring network composed by KIEN5000

Double ring redundancy twisted-pair network can be done in KIEN 5000 shows in Figure 6-2. When a twisted-pair disconnection happens at any place, communication can be re-configured within 300ms.

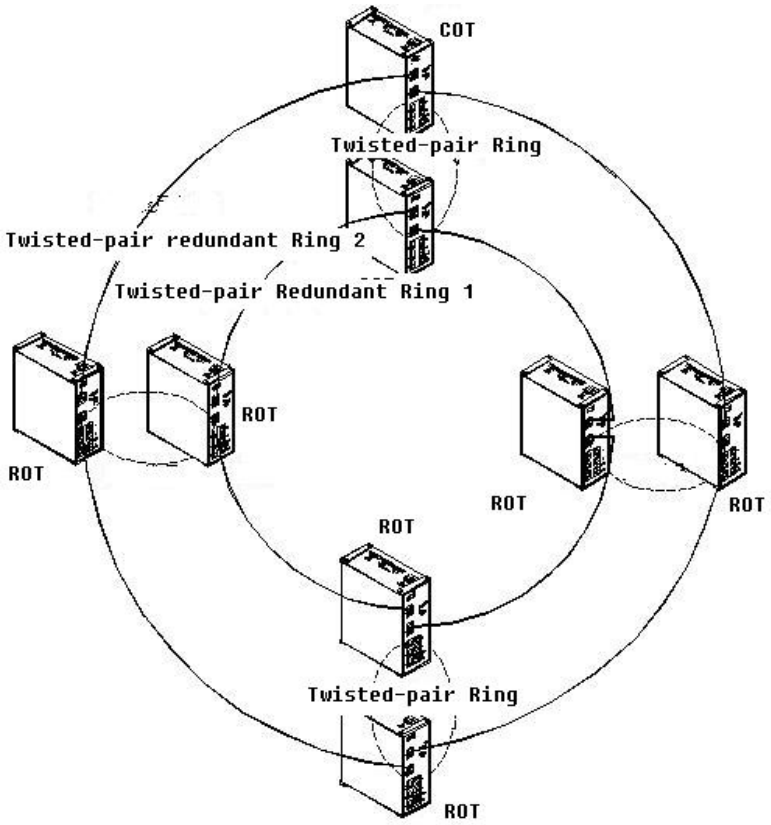
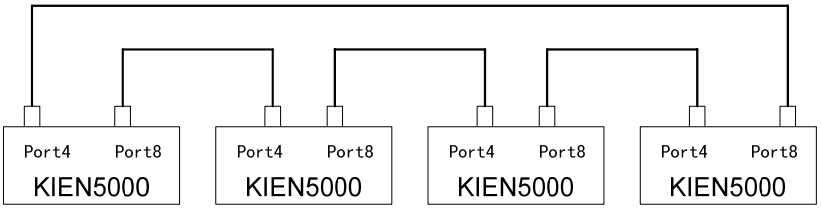


Figure 6-2 twisted-pair redundant double ring network composed by KIEN5000

Attention:

When KIEN5000 is forming a redundant ring network, connection of electrical port 4 and 8 are recommended, namely, the electrical port 4 of one end equipment shall be connected with the electrical port 8 of the other end equipment. This is shown as the following figure.



6.2 System configuration

KIEN5000 Industrial Ethernet Switch is an integrated structure, the 4 10Base-T/100Base-TX Ethernet RJ-45 ports and 4 uplink redundant 10Base-T/100Base-TX RJ45 interfaces are fixed configuration. The power supply voltage is DC 24V. The specific configuration and its corresponding models are shown as Table 6-1.

Table 6-1 Configuration table of KIEN5000

Product Model	Product Description
KIEN5000-8T	4 10Base-T/100Base-TX RJ45 interface and 4 uplink redundant 10Base-T/100Base-TX RJ45 interface

Appendix A Twisted-pair and Pin Distribution

For the connection of 10Base-T/100Base-TX, the twisted-pair must have two pair cable. Each pair is distinguished with two different colors. For example, one strand is green, and the other is the alternate of green and white stripes. RJ-45 connector should be equipped at both ends of the cable.

Warning:

Don’t insert a telephone plug into any RJ-45 port. Only use twisted-pair with RJ45 connectors at both ends conforming to FCC standard.

Fig. A-1 Shows how the connector of RJ-45 is numbered, please make sure that the inserting direction is correct.

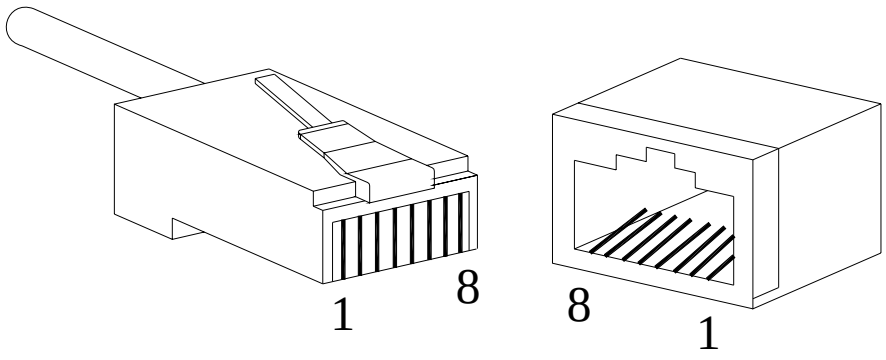


Figure A-1 Connector of RJ-45

Pin distribution of 10Base-T/100Base-TX

Unshielded twisted- pair (UTP) or shielded twisted-pair (STP) will be used for the connection of RJ-45: for the connection of 10Mbps, category 3, 4 and 5 of 100 ohm will be used, and cat.5 of 100 ohm will be used for 100Mbps. Additionally, do make sure that the connecting length of any twisted-pair shall not exceed 100 meter.

Port of RJ-45 supports automatic MDI/MDI-X operation, PC or server may be connected with straight-through cable, or connect with other switch or hub. In straight-through cable, pin 1, 2, 3 and 6 at one end of the cable are

connected to pin 1, 2, 3 and 6 at the other end of the straight-through cable respectively. Cross-over cable should be used for switch or hub with MDI-X port. The pin distribution of 10Base-T/100Base-TX is listed in the table A-1.

Table A-1 Pin distribution of 10Base-T/100Base-TX

Pin	MDI-X signal name	MDI signal name
1	Receiving data ＋（RD+）	Output data＋（TD+）
2	Receiving data －（RD-）	Output data －（TD-）
3	Output data ＋（TD+）	Receiving data＋（RD+）
6	Output data－（TD-）	Receiving data －（RD-）
4，5，7，8	Unused	Unused

Note: “+” “-” denoting cable polarity.

Definition of straight-through cable from RJ45 (8-pin) to RJ45 (8-pin)

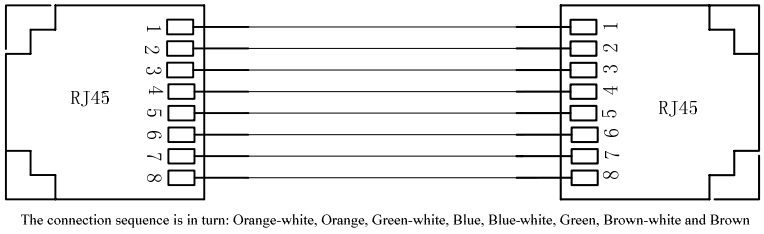


Figure A-2 Cable sequence of straight-through cable

Definition of Cross cable from RJ45 (8-pin) **to** RJ45 (8-pin)

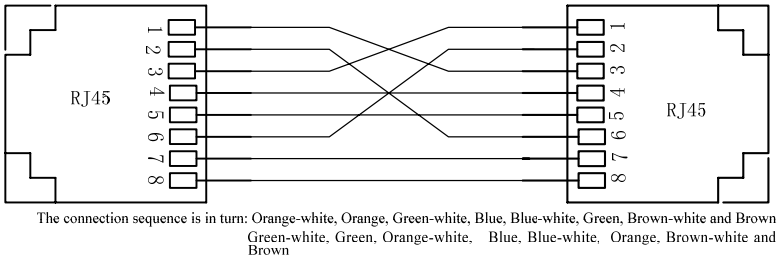


Figure A-3 Cable sequence of cross-over cable

Appendix B Cable Type and Specifications

The cable type and specifications are shown as table B-1:

Table B-1 Cable type and specifications

Cable	Type	Max. length	Connector
10Base-T	Cat.3, 4 and 5 100 ohm UTP	100m（328 foot ）	RJ-45
100Base-TX	Cat.5 –100 ohm UTP	100m（328 foot ）	RJ-45

Appendix C Glossary

Terminology	Explanation
10Base-T	Twisted-pair standard of Cat3, Cat4 and Cat5 in IEEE specification for 10Mbps Ethernet
100Base-TX	Twisted-pair standard of Cat5 or above in IEEE specification for 100Mbps Fast Ethernet
Adaptive	A characteristic that is automatically configured to adaptive mode for the speed, duplex and traffic control port.
Bandwidth	The information capacity that the channel can transmit. For instance, the bandwidth of the Fast Ethernet is 100Mbps（bit per second）.
Baud Rate	It expresses the signaling rate which is defined as the change times of the status for the electric or optical transmission medium within 1 second.
Bridge	One of network equipments which run on the layer2 in the OSI layer7 model, and it can be connected to the LAN or network segment which uses the same protocol. It presents the automatic network address learning and network configuration function.
Traffic Control	It is a congestion control mechanism. The network equipment sends the data to the equipment which has overloaded and causes the port to congest. The traffic control can prevent the data packet from loss and avoid the congestion for the port.
VLAN	It is the Virtual Local Area Network, which means that it takes the network management software to establish the point to point logic network which can cross different network segment and various network on the switching LAN.
Broadcast	One data packet is sent to all equipments on the network.
Broadcast storm	Restless forward broadcast frame or multicast frame on bridge caused by the bridge ring.
Full Duplex	Use switches to set up the point to point connection among nodes in the LAN and allow them to receive and send data packet at the same time.
Half Duplex	The communication for two nodes can only move toward one direction at the same time, but can not move toward both directions.
MDI	It is the Medium Dependent Interface, in which, one Ethernet port is taken as the receiving terminal to connect to the port of other equipment.
MDI-X	Medium Dependent Interface Cross-over

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KIEN6000

Industrial Ethernet Switch

User's Manual

Beijing KYLAND Technology Co., Ltd.

KIEN6000 Industrial Ethernet Switch User's Manual

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Preface

KIEN6000 are high-performance industrial Ethernet switches designed and developed by KYLAND for industrial applications. KIEN6000 may operate in harsh industrial environments because they employ high-performance switch engines, solid, fanless and ribbed case with efficient heat dissipation surface, protections against overcurrent and overvoltage of power input, EMC protections, and excellent protection performance of RJ45 ports. The redundant network, redundant power supply and management function ensures more reliability for the system operation.

The User's Manual for KIEN6000 Industrial Ethernet Switch mainly introduces the information on technical principles, specifications, hardware structures, installations etc. to provide users with references in startup, expansion and regular maintenance. It is a practical manual that can be used by users in trainings and helps the relevant technicians to improve their knowledge and understanding of KIEN6000 industrial Ethernet switch.

This manual mainly contains the following contents:

Chapter 1: product overview and features;

Chapter 2: specifications & service functions;

Chapter 3: hardware structure;

Chapter 4: installation;

Chapter 5: test method;

Chapter 6: networking & configurations;

Appendix A twisted pair and pin distribution rules;

Appendix B cable types and specifications;

Appendix C glossary.

All product specifications are subject to change without notice. Please visit our website or contact our sales representative directly to have the update details.

Safety Notices

These products have good and reliable performance in designed use range. But man-made damages to the switch shall be avoided.

- Read this Manual thoroughly and keep it well for future reference.
- Do not place the switch at where is close to water source or dampness.
- Place power cables at where cannot be touched and do not place any stuff on power cables.
- Do not tie or wrap power cables to prevent fire.
- Fasten power connectors and connectors of other units tightly and check them often.

In the following cases, please power off immediately and contact us.

1. Water into the switch;
2. The switch is damaged due to falling or cases are broken;
3. The switch has abnormal operations or its performance completely changes;
4. The switch gives off odor, smoke or noise.

- Please keep the switch clean. If necessary, wipe it with soft cotton cloth.
- Do not repair it by yourself except for clear instruction in this Manual.

Warning Marks:

This Manual uses following two kinds of conspicuous warning marks to remind users in operating:

Warning: please give enough attention to the remarks following the mark. Inappropriate operations may cause severe damages to the switch and operators.

Attention: pay attention to the remarks following the mark.

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Chapter 1 Product Overview

1.1 Product Overview

KIEN6000 is high-performance industrial Ethernet switches designed and developed by KYLAND for industrial applications. KIEN6000 may operate in harsh industrial environments because they employ high-performance switch engines, solid, fanless and ribbed case with efficient heat dissipation surface, protections against overcurrent and overvoltage of power input, EMC protections, and excellent protection performance of RJ45 ports. The redundant network, redundant power supply and management function ensures more reliability for the system operation.

KIEN6000 can be installed either by DIN rail or wall mounting. On the front panel, there are 2 uplink redundant 100Base-FX ports, which can form redundant ring network. In the event of system failure, the recovery time of the redundant ring network will be less than 100ms. It provides 2 uplink redundant 10Base-T/100Base-TX RJ45 ports to be able to form redundant ring network, with recovery time less than 100ms. Therefore, double redundant ring networks are possible. Each RJ45 port has adaptive function, capable of automatically configuring to 10Base-T or 100Base-TX status and full duplex or half duplex operation mode. It supports for auto MDI/MDI-X connection.

1.2 Features

High-performance Industrial Ethernet Switch

1. 10/100Base-T/TX Ethernet ports, adaptive, full/half duplex, auto MDI/MDI-X connection
2. 100Base-FX fiber ports, single mode/multimode, full duplex, redundant
3. High speed redundant ring with recovery time < 100ms
4. Chinese & English management supports Telnet, SNMP protocol, compliant with networking regulations, able to be managed and monitored by third part software.
5. Supports VLAN to control broadcasting domain and segment flow, port aggravation, port mirroring, port priority, IGMP etc.
6. Alarm relay output for power supply and port link.
7. Broadcast storm control

Powerful Management Function

1. It can be managed in web browser by entering IP address.
2. It can be logged in by telnet or hyper terminal.
3. Port aggravation, port mirroring, VLAN, port priority and IGMP can be configured in the management.

Industrial Power

1. Industrial power input of DC24V(DC18V ～ 36V), 12VDC(9 ～ 18VDC),48VDC(36 ～ 72VDC),110VDC(66 ～ 154VDC),220VAC(165 ～ 265VAC),220VDC(220 ～ 370VDC)are also available.
2. Reliable protection for EMC and against over-current/over-voltage.
3. Redundant power input

Rugged Design

1. Ribbed heat-removal design (fanless); operation at -40℃ to +75℃
2. Solid IP40 housing
3. Easy DIN-Rail mounting or optional wall-mounting

1.3 Package Checklist

1. Packing list

Kyland KIEN6000 Switch	1
3-core DC power terminal block	2
2-core alarm output terminal block	1
User Manual	1
Management User's Manual	1
Customer Service Guide	1

2. Unpacking check

Before opening the carton, place it stably, pay attention to the direction of the packing carton, and ensure its right side is facing upward, so as to prevent KIEN6000 from falling apart after opening the case. If a hard object is used to unclench the case, do not overly extend the hard object into the carton to avoid damage of the equipments inside.

After opening the carton, check the quantity of KIEN6000 according to the packing list, and check the appearance quality of KIEN6000.

Warning:

For the built-in precise parts of equipments, please handle with care and avoid strenuous vibration to avoid affecting the performances of equipments.

Chapter 2 Specifications & Service Functions

2.1 System Specifications

The system specifications of KIEN6000 industrial Ethernet switch are shown in Table 2-1.

Table 2-1 System specifications

System Indexes	KIEN6000
RJ45 port	4 ×10Base-T/100Base-TX
Redundant RJ45 port	2 ×10Base-T/100Base-TX
Redundant fiber port	2 x 100Base-FX-SM/MM
System parameters	Supporting standard: IEEE802.3, IEEE 802.3x, IEEE 802.3u, IEEE 802.1p, IEEE 802.1Q Store-and-Forward speed: 148810 pps Max. filtering speed: 148810 pps Switching mode: Store-and-Forward Switching bandwidth of system: 5.6G MAC address list:8k Max. VLAN quantity: 4094 Electromagnetic compatibility interference: EN55022 Electromagnetic compatibility immunity: EN50082-2
TP port	Physical port: shielded RJ-45 RJ-45 port: 10Base-T/100Base-TX, supporting automatic negotiation function Port standard: in line with IEEE802.3 standard Transmission distance: <100m
Fiber port	Optical power: >-13dbm(SM) >-20dbm(MM) Receiving sensitivity: <-28dbm(SM) <-35dbm(MM) Wave length: 1310nm(SM) 1550nm(SM) 1310 nm(MM) Transmission distance: 20～80Km(SM) <2Km(MM) Connector type: SC/FC Transmission rate: 125Mbps
CONSOLE interface	Physical interface: shielded RJ-45 Interface standard: in line with RS232 standard (3 lines) Interface rate: 9600bps
Power supply	Input voltage: 12VDC(9～18VDC), 24VDC(18～36VDC), 48VDC(36～72VDC), 110VDC(66～154VDC), 220VAC(165～265VAC), 220VDC(220～370VDC) Input power consumption: <6W Overcurrent protection: built-in

Mechanical parameter	Physical dimensions (height×width×depth): 142mm×55.4mm×120.5mm(excluding the dimensions of DIN rail and wall-mounting components) Mounting mode: DIN rail or wall-mounting Heat removal method: Ribbed aluminum casing heat dissipation without fan. Outlet type: front outlet for service, top outlet for power supply and network management Shell protection: IP40 Weight: 1kg
Ambient conditions	Operating temperature: -40℃～75℃ Storage temperature: -45℃～85℃ Humidity: 0～95% (non-condensing)

2.2 Port Specifications

1. 4 10Base-T/100Base-TX RJ45 ports. Each RJ45 port is adaptive, capable of automatically configuring to 10Base-T or 100Base-TX state and automatically working in full duplex or half duplex operation mode, supporting automatic MDI/MDI-X connection. The transmission distance is less than 100m.

2. 2 pairs of uplink redundant 100Base-FX ports of single mode or multi-mode. The maximum throughput of each pair of fiber port is 100Mbps, and it is forced to work in 100M full duplex mode. They support redundant network with the recovery time less than 100ms.

3. 2 uplink redundant 10Base-T/100Base-TX RJ45 ports, which can be set as straight-through or redundant mode. When it is redundant, it supports for rdudant network with less than 100ms.

4. Comply with/meeting IEEE802.3/802.3U/802.3X.

5. Meanings of RJ45 port LED:

   Yellow lamp – port rate LED; on: 100M; off: 10M

   Green lamp – link state LED; on: effective link; blinking: active network; off: no link.

2.3 Service function

Configuration and Management

At KIEN6000, the settings, queries and management can be realized for the whole switch or network

system through CONSOLE interface, Telnet and Web browner.

LED Indicator

The LEDs indicate the port status correctly including transmission rate, link status and system status.

VLAN

The network can be divided into several VLANs according to ports, through which the users in one VLAN can communicate each other. The VLAN of KIEN6000 conforms to IEEE802.1Q and can realize the communication within one VLAN of different switches. KIEN6000 supports up to 4094 VLANs based on IEEE802.1Q.

802.1p Prioritization

KIEN6000 conforms to 802.1p, which is used the most widely in LAN environment. The end-users of KIEN6000 can make use of this function to configure the port-based prioritization when 802.1p is not supported at user's end and different priority is necessary for different ports' services. Only the data package without Prioritization in the Packet in the ports can be affected by this function. Each port of KIEN6000 supports 2 levels (high, low) prioritization.

Layer-2 Switching

Switches work in two ways: Cut-Through and Store-and-Forward. In Cut-Through, a data packet is immediately relayed further after detecting the target address; in Store-and-Forward, a data packet is first read-in completely and checked for errors before the switch relays the same. KIEN6000 employs Store-and-Forward that is a switching mode widely used.

IGMP

IGMP means Internet Group Multicast Protocol. KIEN6000 supports IGMP and query.

Port Trunking

At KIEN6000, multiple physical ports can be aggregated into one logic port, which has the same rate, duplex mode and VLAN ID. Port Trunking can be configured in one single switch for max 4 ports. In this way, the pressure of network traffic is reduced.

Port Mirroring

The data of one port can be mapped to another port for user to real-time monitor the communication.

Setting for Working Mode of Port

KIEN6000 is able to set the working mode of all ports through management: full/half duplex adaptive, enforced full duplex, enforced half duplex, enforced 10M, enforced 100M, 10M/100M adaptive etc.

STP (Spanning Tree Protocol)

KIEN6000 supports for STP (Spanning Tree), STP enable the switch to make sure of the dual paths and don't cause loop. It only enables the shortest path and block other path to avoid loop.

Broadcast Storm Control

Broadcast storm is the ceaseless transfer of broadcast frame or multicast frame in bridge, which is caused by loop and will waste much bandwidth. The purpose of broadcast storm control is to optimize the performance of switch network. KIEN6000 supports the broadcast storm based on percentage. With the control percentage, the broadcast flow of KIEN6000 will be monitored and controlled effectively. The switch will filter out the over flow and ensure the flow percentage is normal once the bandwidth of broadcast flow exceed the limit.

Static MAC Address Binding

At KIEN6000, the port can be bound with static MAC. When the MAC address is difference from the one of connected devices, KIEN6000 will close the port to prevent the visit of illegal terminal devices.

Alarm

The alarm functions of KIEN6000 are for power supply and port link. Any failure of power supply occurs, the alarm signal will be output by alarm terminal. The alarm function of port link can be set as enabled or disabled from the management system. Open when no alarm and closed when there is alarm.

Chapter 3 Hardware Structure

3.1 System structure

The hardware structure of KIEN6000 is shown in Figure 3-1.

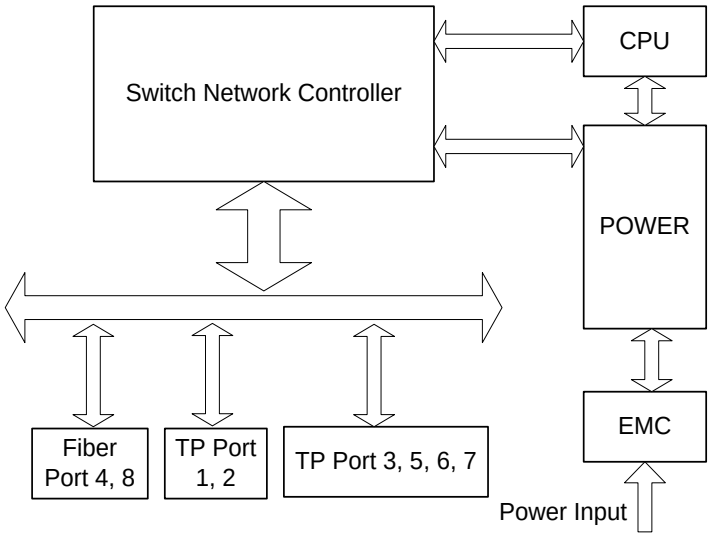


Figure 3-1 Hardware structure

The system hardware mainly consists of:

1. The switching network controller employs the high-performance ASIC chip technique and provides second-layer wire rate forward of data packages.

2. Fiber ports adopt integrated fiber optic transceiving modules and have stable performance

3. The power supply adopts the industrial power and offers overcurrent, overvoltage and EMC protections.

4. All Ethernet ports and console interfaces have EMC protections.

3.2 Switch Structure

3.2.1 Casing

KIEN6000 case is a small DIN rail or wall mounting structure. The entire switch is a fully sealed structure, with protection class up to IP40. The case's left and right side plates are made of ribbed aluminum and act as a part of the heat dissipation system of the switch. The ribbed structure can double heat dissipation surface. The heat generated when the unit is working is effectively

dissipated into the environment via the ribbed heat-dissipation surface in the form of radiation and convection greatly increasing the high temperature resistance of equipment. Discarding the traditional form of fan for heat dispersion reduces power consumption of the entire unit and increases the stability of the system. The figuration of KIEN5000 case is shown in Figure 3-2.

Dimensions: 142mm×55.4mm×120.5mm (height×width×thickness)

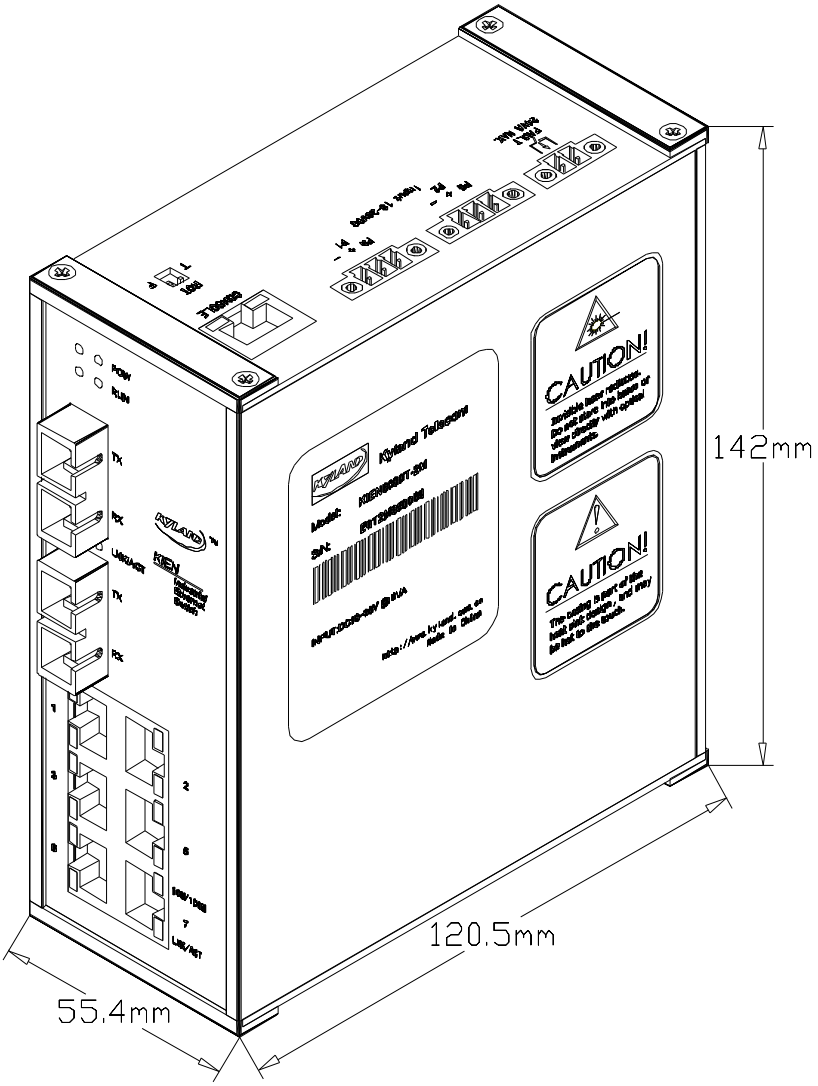


Figure 3-2 Physical Dimensions

Warning: The case is a part of the heat dissipation system, do not touch the case when the switch operates to avoid heat burn..

3.2.2 Front panel

In the front panel of KIEN6000, there are 2 uplink (redundant) 10Base-T/100Base-TX RJ45 ports, 4 10Base-T/100Base-TX RJ45 ports and 2 pair of uplink (redundant) fiber ports, and LED indicators. Its structure is shown in Figure 3-3:

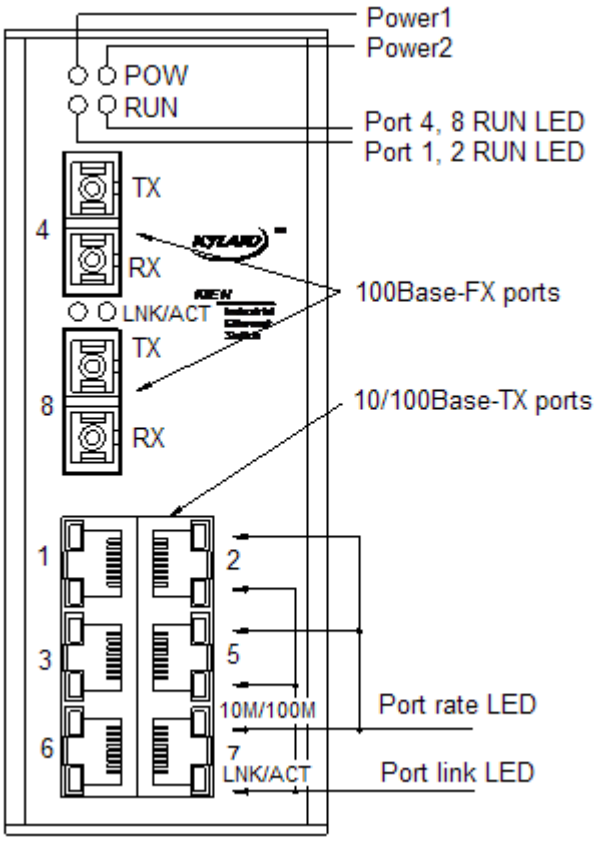


Figure 3-3 Front Panel

Fiber interface

Each KIEN6000 offers 2 pairs of uplink redundant 100Base-FX full-duplex single-mode or multi-mode fiber ports. The port numbers are 4 and 8. The connector may be SC or FC. The fiber ports are used in pair including a TX and a RX. TX port is the transmitting end and connected with the receiving end RX of the remote switch. The RX port is the receiving end and connected with

the transmitting end TX of the same remote switch. The two pairs of uplink redundant 100Base-FX fiber ports can form the optical fiber redundant ring network. In case of system failures, the redundant recovery time of the ring network is less than 100ms, which increases reliability of network running effectively.

Uplink redundant Ethernet RJ45 port

Each KIEN6000 has 2 uplink redundant 10Base-T/100Base-TX RJ45 ports No. 1 and 2. These two uplink ports can be set as straight-through mode or redundant mode. In straight-through way, they are used as normal Ethernet ports, in redundant way, they support for redundancy of TP cable network with recovery time less than 100ms.

Ethernet RJ45 port

Each KIEN6000 offers 4 10Base-T/100Base-TX Ethernet RJ45 ports numbered 3, 5, 6, and 7. Each RJ45 port is adaptive and supports auto MDI/MDI-X connection. By straight-through or cross-over cable wiring, switches can be connected with terminals, servers, hubs, or other switches. Each port supports the IEEE802.3x adaptive function and it is able to automatically select optimal transmission mode (half-duplex or full-duplex) and rate (10Mbps or 100Mbps). If switches that connected to these ports do not support the adaptive function, these ports will transmit correct data with the default half-duplex transmission mode

LED indicator

The indicators on the front panel of KIEN6000 can indicate system operation and port state to find and correct faults. The Table 3-1 shows the functions of these LED indicators on the front panel.

Table 3-1 LED Indicator Description

LED	Condition	State
System state LED		
Port 4,8 RUN	On	Port 4 & 8 are set as redundant mode and the switch is set as local.
	Blinking	Port 4 & 8 are set as redundant mode and the switch is set as remote.
	OFF	Port 4 & 8 are set as straight-through mode.
Port 1,2 RUN	On	Port 1 & 2 are set as redundant mode and the switch is set as local.
	Blinking	Port 1 & 2 are set as redundant mode and the switch is set as remote.
	OFF	Port 1 & 2 are set as straight-through mode.

Power State		
POWER1	On	Power is being supplied to power input POWER1
	Off	Power is not being supplied to power input POWER1
POWER2	On	Power is being supplied to power input POWER2
	Off	Power is not being supplied to power input POWER2
Fiber Ports State(4,8)		
LINK/ACT	On	Active link established
	Blinking	Active link
	Off	No active link
RJ45 Ports State		
Each RJ45 port has two indicators: the yellow is the indicator for port rate and the green is port link state.		
10M/100M (Yellow)	On	Data is being transmitted at 100Mbps
	Off	Data is being transmitted at 10Mbps
LINK/ACT (Green)	On	Active link established
	Blinking	Active link
	Off	No active link

3.2.3 Top panel

On the top panel of KIEN6000, there are two power input terminal blocks, alarm relay output, RS232 Console interface, DIP switches and grounding screw etc as shown in Fig 3-4.

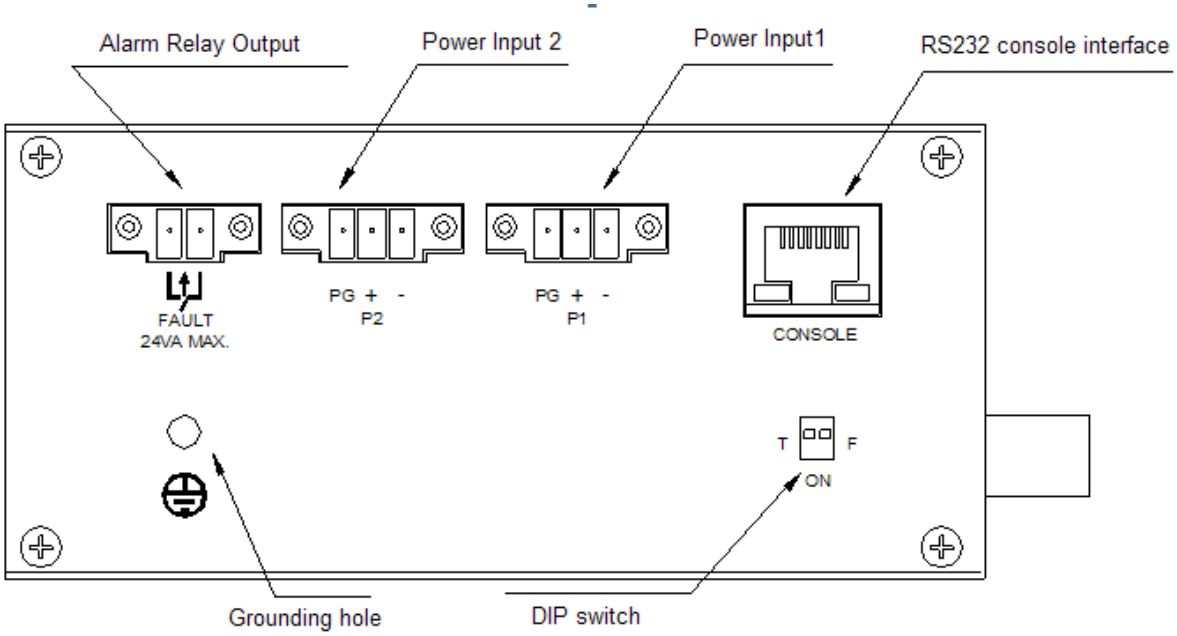


Figure 3-4 the top panel

Power input terminal

KIEN6000 has redundant power input function. P1 and P2 are two power input terminals. Any one of them can be used independently. Or, they can be connected with two sets of external independent DC power systems. In case of failure, the switch is able to run normally, improving network reliability. 3-pin terminals with the space of3.81 mm are used to connect powers and the diameter of power cables is less than 1.5mm.

Wiring is shown in the Figure 3-5. Connection and mounting steps are as follows

1. Peel off the outer skin of a length of 5mm of the power cable and twist the copper wires together;

2. Loosen the power cable screw with a 2.5mm one-slot screwdriver. Insert the power cable into holes at the tail of the terminal and screw up the power cable screw.

3. Plug the power terminal into the DC socket of the switch. Screw up two terminal locking screws with s 2.5mm one-slot screwdriver to make the terminal connect with the power connector tightly.

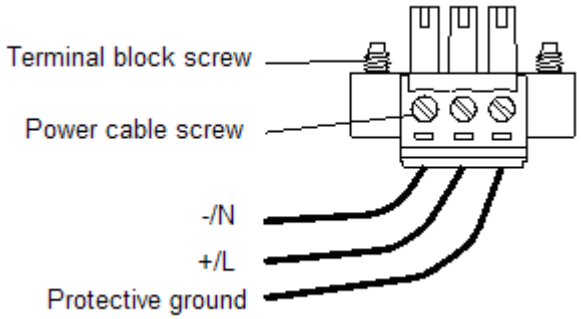


Figure 3-5 DC Power Terminal Wiring

Alarming relay output terminal

This terminal is a group of normally-open contacts and its appearance is identical to the power input terminal. Under the normal status, there is no warning and this terminal is in open status. In case of failures of any one power, the terminal is closed. It can be connected with other switching value acquisition devices or warning lamp and warning buzzers, to remind operators in time. The maximum voltage of this terminal is DC350V and its maximum input power is 120mA The Figure 3-6 is the schematic when the switch connects with an external warning indicator. The wiring of other applications is similar with this.

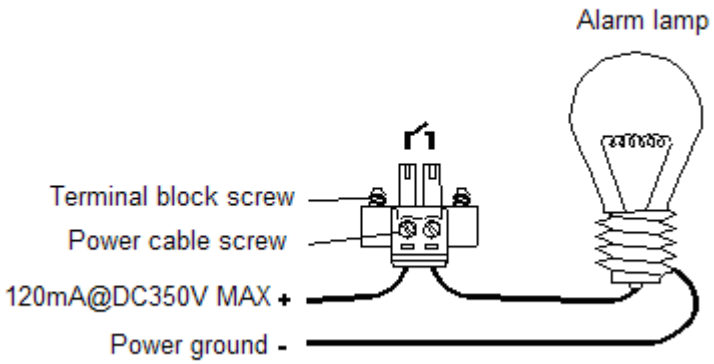


Figure 3-6 the alarm lamp and relay output

RS232 console interface

The RS232 console interface of KIEN6000 is a shielded RJ45 connector based on 3-line RS232. The user can connect the interface with the 9-pin serial port of computer by a cable, of which one end is RJ45 and the other end is DB9F plug. Run the hyper terminal software of WINDOWS system, you will be able to use console software and realize the configuration, maintenance and management of KIEN6000.

The connection of RS232 console interface and 9-pin serial port of PC is shown in Fig 3-7:

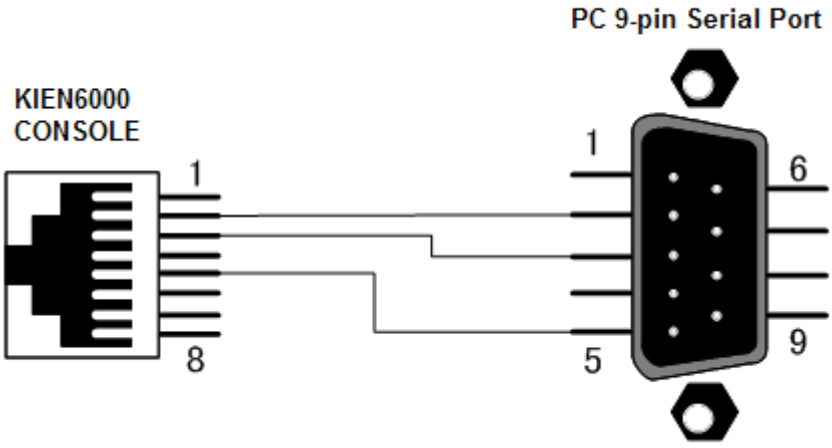


Figure 3-7 Console interface wiring

DIP switch

The switch has two positions that are defined T and F respectively, which are used to set port 4, 8 and 1, 2 as straight-through, redundant, local or remote.

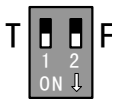
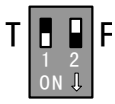
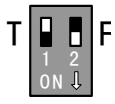
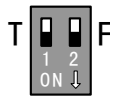
Straight-through (Direct Link Mode): the ports should be connected with Ethernet devices and cannot be connected into a ring.

Redundant and remote (ROT): the ports are for a ring connection, and cannot be used as normal direct link connection. The switch is performing as a Slave in the ring.

Redundant and local (COT): the ports are for a ring connection, and cannot be used as normal direct link connection. The switch is performing as a Master in the ring.

The relationship between the specific positions of the switch and its properties is listed in the Table 3-2.

Table 3-2 Table 3-2 Relationship between Positions and Properties of the Switch

Switch Position			**Properties**
Position Schematic	**Logic position**		
	T	OFF	Port 4,8 are set as straight-through;
	F	OFF	Port 1,2 are set as straight-through
	T	OFF	Port 4,8 are set as redundant and remote;
	F	ON	Port 1,2 are set as straight-through
	T	ON	Port 4,8 are set as redundant and remote;
	F	OFF	Port 1,2 are set as redundant and local
	T	ON	Port 4,8 are set as redundant and local;
	F	ON	Port 1,2 are set as redundant and local

Attention:

In the redundant ring network, only one switch can be set as the Master and others are set as Slaves.

3.2.4 Bottom panel

There is a grounding screw hole at the bottom panel of KIEN6000. As shown in Figure 3-8, the grounding wire is connected to the cold pressed terminal. Both of them are fixed in the hole with grounding screw. The other end of grounding wire can be grounded. The section of grounding wire is no less than 2.5mm.

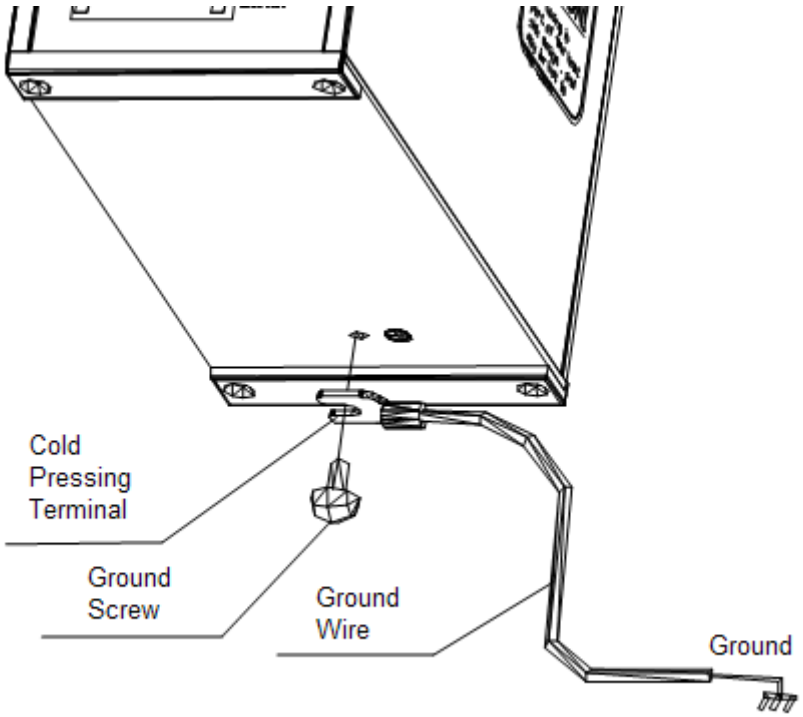


Figure 3-8 Grounding Method

Chapter 4 Installation

4.1 Requirements

The switch is single-body structure and can be directed locked on the standard 35mm DIN rail or is mounted on vertical walls or internal walls of the switch cabinet with the wall mounting part.

Before mounting the switch, make sure of appropriate operating environment, including correct power requirements, enough space, and suitable distance to the networking units. Please also confirm the following mounting requirements:

1. Power supply: standard products of KIEN6000 use the redundant 24VDC(18～36VDC), other available power inputs include redundant 12VDC(9～18VDC), redundant 48VDC(36～72VDC), single 110VDC(66～154VDC), single 220VAC(165～265VAC), single 220VDC(220～370VDC).

2. Environment temperature: -40℃～75℃

3. Grounding resistance: <5Ω

4. Check whether uplink twisted-pair wires or optical fibers are laid in place in accordance with configuration requirements under the contract.

5. Avoid direct sunshine and keep it away from heating sources or areas where have strong electromagnetic interference.

6. Standard KIEN6000 industrial Ethernet switches only provide DIN rail mounting parts. Users need to prepare DIN rails. But if the wall mounting is required, users need to purchase the wall mounting part additionally. Users must prepare screws, nuts and tools required by the wall mounting to ensure reliable mounting.

7. Check existence of cables and connectors required by mounting.

4.2 Install Switch

4.2.1 DIN Rail Mounting

The standard 35mm DIN rail-type mounting provides most industrial applications with convenient mounting. When you take out the switch from the packing box, you will find that the green plastic DIN rail-connecting position has already been fixed on the rear panel of KIEN6000. The Figure 4-1 shows the size of rail-type mounting. If you want to mount KIEN6000 on the DIN rail, please check mounting of the DIN rail before mounting the switch. The check shall mainly

focus on two points below:

1. Ensure the DIN rail is fixed solidly, other units are not on it, and enough space is reserved for mounting the switch.

2. On the DIN rail, make sure there is power input that is suitable for operation of KIEN6000.

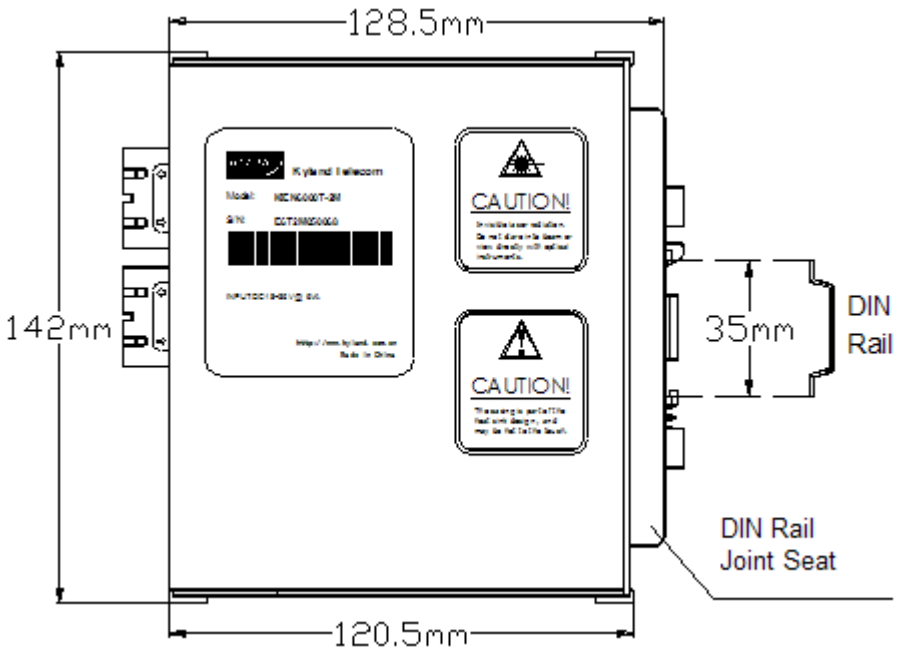
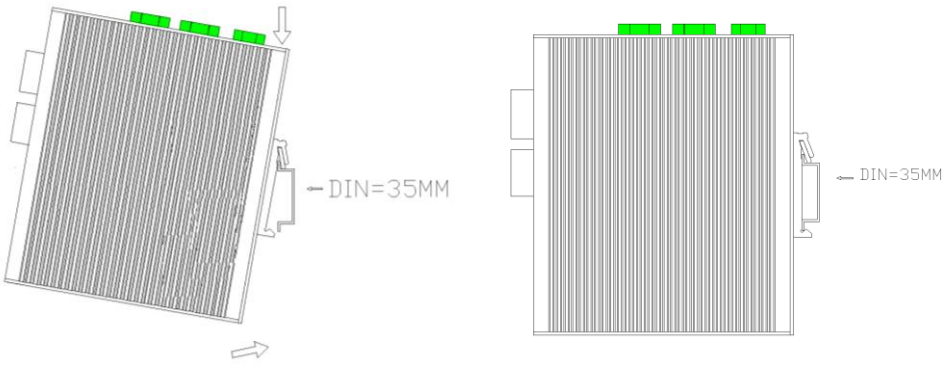


Figure 4-1 DIN Rail Mounting

After choosing the mounting position of the switch, mount it on the DIN rail according to following steps:

1. As shown in the Figure 4-2a, insert the lower part of the DIN rail into the fixing slot with spring support under the rail connecting seat. Push the bottom panel of the switch upward slightly and turn it,.

2. As shown in the Figure 4-2b, lock the DIN rail Into the DIN rail connecting position and confirm reliable mounting on the DIN rail of the switch.



a b

Figure 4-2 Mount KIEN6000 on DIN rail

4.2.2 Wall-mounting

In the situation that DIN rail-type mounting is inconvenient, it is better to adopt wall mounting. KYLAND provides users with wall mounting board that is mounting parts for mounting of KIEN5000. The size of wall mounting is shown in the Figure4-3.

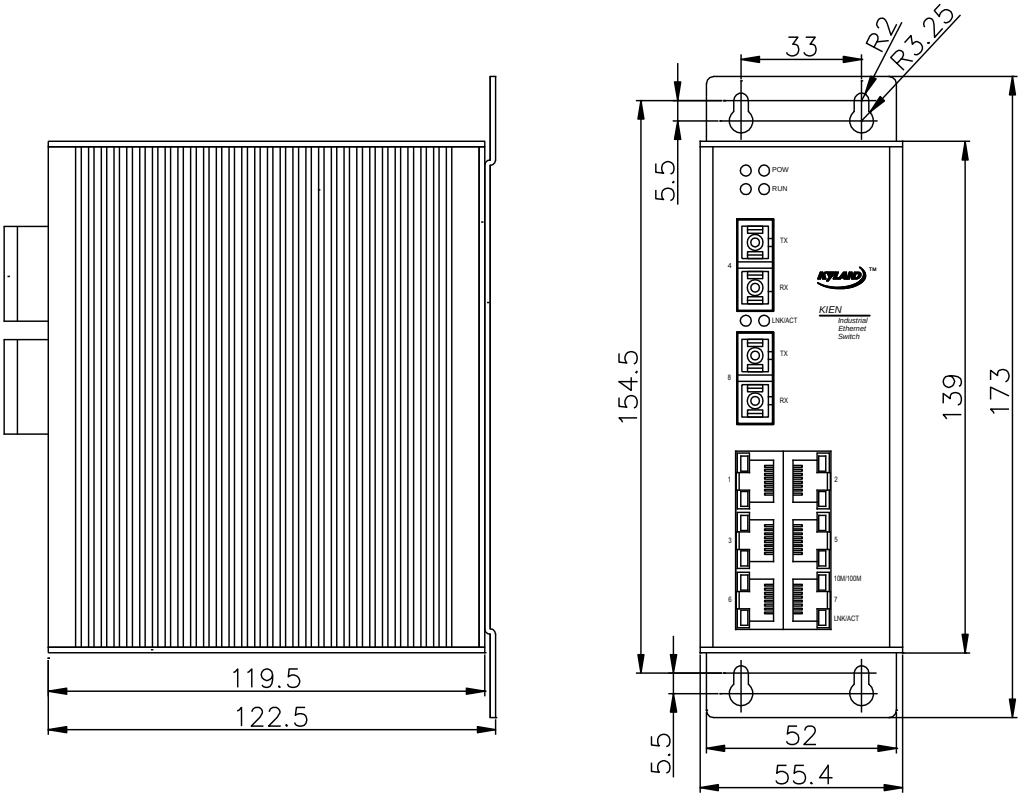


Figure 4-3 Wall-mounting dimension

Attention:

The wall mounting plate is not a part of the standard accessories of KIEN6000. If you need it, please order it additionally when you order the switch.

The steps of wall mounting of KIEN6000 are as follows:

1. Remove the DIN Rail kit from the switch

2. Take out the wall mounting board and its mounting screws (M3×6 cross recessed countersunk flat head screws) from the packing box. Mount the board on the position where the DIN rail kit is. Ensure the mounting direction of the plate is as shown in the Figure 4-4.

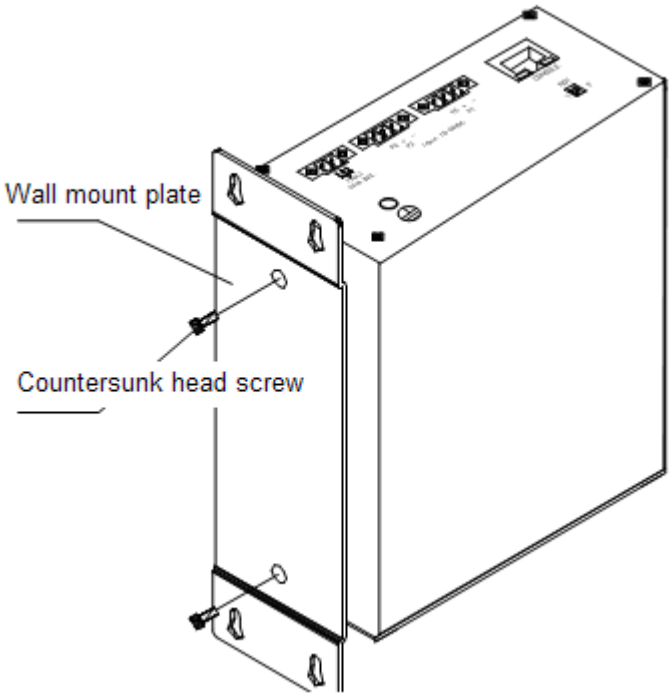


Figure 4-4 Install wall-mounting plate

3. Select a vertical wall or internal wall of the switch cabinet as the mounting position. If the vertical wall is selected, it is recommended to mount the switch with Φ6 plastic expansion bolts and Φ3 taping screws. According to the mounting size in the Figure 2-3, drill 4 Φ6 holes on the wall with a impact electric drill with a depth that can completely contains the Φ6 plastic expansion bolts. Insert the plastic expansion bolts into holes on the wall and screw the tapping

screws into the plastic expansion bolts with a cross head screwdriver. But do not screw them tightly and keep a space of about 5mm. If the internal wall of the switch cabinet is selected, recommend to open 4 M3 screw holes when the switch cabinet is manufactured in accordance with the mounting size in the Figure 2-3. Or drill 4Φ4 holes with a electric portable drill on site. Screw four M3×10 cross recessed pan head screws into 4 holes. If the holes have no threads, mount four M3 nuts on its back. At last, do not completely screw down screws and keep a space of 5mm.

4. After screws are fixed on the wall, mount the switch on the selected position and make 4 screws pass through 4Φ6.5 holes on the wall hanging plate. Slide down the switch, as showed in the Figure 4-5. Screw down 4 screws to fasten the switch on the wall or the internal wall of the switch cabinet.

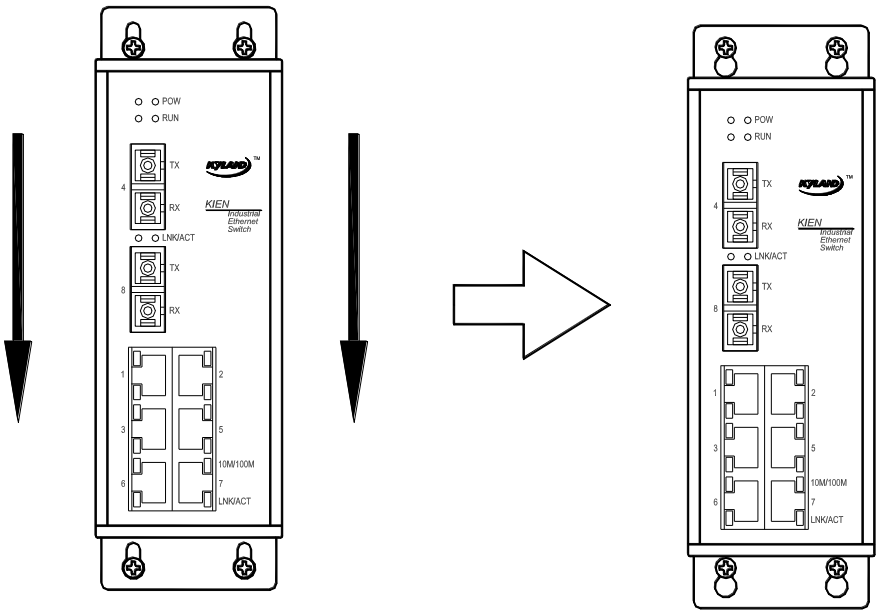


Figure 4-5 Wall mount

4.3 Cable connection

After KIEN6000 is mounted properly, cable can be wired, which mainly include cable connection of the following ports:

1. Service Ports

KIEN6000 provide 10Base-T/100Base-TX Ethernet RJ45 ports that are connected with terminals with straight-through cables and with networking units with cross-over cables.

2. Network management

KIEN6000 is connected with the serial port of PC via the console interface of the top panel. Users can make a network management cable with proper length according to Figure 3-7.

3. Power input

Use the right power supply as instruction on KIEN6000. After other cables are connected, power cable can be connected.

4.4 Optical Fiber Cable Wiring

Each KIEN6000 provides 2 pairs of uplink redundant 100Base-FX full-duplex single-mode or multi-mode fiber ports that can build the optical fiber redundant ring network. In case of failures of units or optical fibers in the network, the network recovers communication within 100ms. Fiber ports may adopt SC or FC according to requirements.

Warning:

The switch use laser to transmit signal in optical fibers. The laser is in accordance with requirements for the Class 1 laser products. In normal operation, it is harmless to eyes. But when units are connected with powers, do not directly watch optical transmitting ports and the end surface of optical fiber terminal.

Connection steps of pluggable optical fiber modules are showed as follows:

1. Remove and keep rubber cases in SC or FC ports. When it is not working, mount the rubber cases to protect optical fiber terminators.

2. Check cleanness of optical fiber terminators. Wet clean paper towel or tampon slightly and clean plugs of optical fibers softly. Dirty optical fiber terminators will reduce optical transmission quality and affect port performance.

3. Connect one side of the optical fiber with an optical port of the switch and connect the other side with an optical port of another unit, as showed in the Figure 4-6.

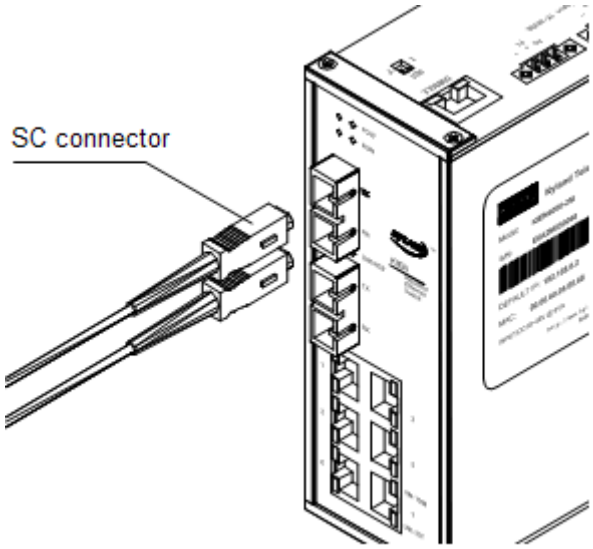


Figure 4-6 Optical Fiber Cable Wiring

4. Upon finishing connection, check the LNK/ACT indicator for the optical port on the front panel of the switch. On means effective connection.

4.5 Cable wiring

Cable wiring should meet the following requirements:

1. Before cable wiring, check whether the specifications, models and quantities of all cables and make sure all comply with project requirements.

2. Befoere laying, check whether cables and wires are damaged and ensure they have ex-works records and quality guarantee, and other certificates that prove their quality.

3. The specification, quantity, route, and position of cables and wires shall accord with design requirements under construction drawings. The laying length of each cable and wire shall be determined according to real position.

4. No intermediate break or joint is allowed for the cables to be laid.

5. User's cables and power cable should be laid separately.

6. Inside walkways, the cables should be properly arranged in good order, with uniform, smooth and flat turnings.

7. Cables should be straightly laid in cable channels. Extruding of cable from cable channels to block other outlet or inlet holes is not allowed. The cables at the outlet part of cable channel or at

turnings should be bundled and fixed.

8. If cables, power line and grounding conductor are laid in the same channel, cables, power line and grounding conductor should be not folded or blended together. If a cable line is overly long, coil and place it in the middle of the cabling rack, do not let it cover on other cables.

9. For optical fiber cable, avoid knotting it and try not to turn it. Tie it property and lay it separately.

10. There must be the relevant marks at both ends of cable and the information on the marks should be explicit to facilitate maintenance.

Chapter 5 Test Method

5.1 Self-test

After the switch is powered, the POW LED is always on, and RUN LED is on/blinking/off according to the property set by the DIP switch.

5.2 Test TP ports

Power KIEN6000 as shown in Fig. 5-1, make any two TP ports connect with the network port of the two testing PCs by straight-through cable, transmit Ping command mutually, both sides can correctly Ping to each other and no data package is lost. Meanwhile, the yellow lamp on the corresponding port shall be always on (computer network interface operates at100Mbps), or off (computer network operates at 10Mbps), and the green lamp on the corresponding port shall be blinking. All indicates the hardware of the tested TP ports operates normally. The same test method will be used to test all the rest TP ports (For detailed operation of the Ping command, please refer to the following examples).

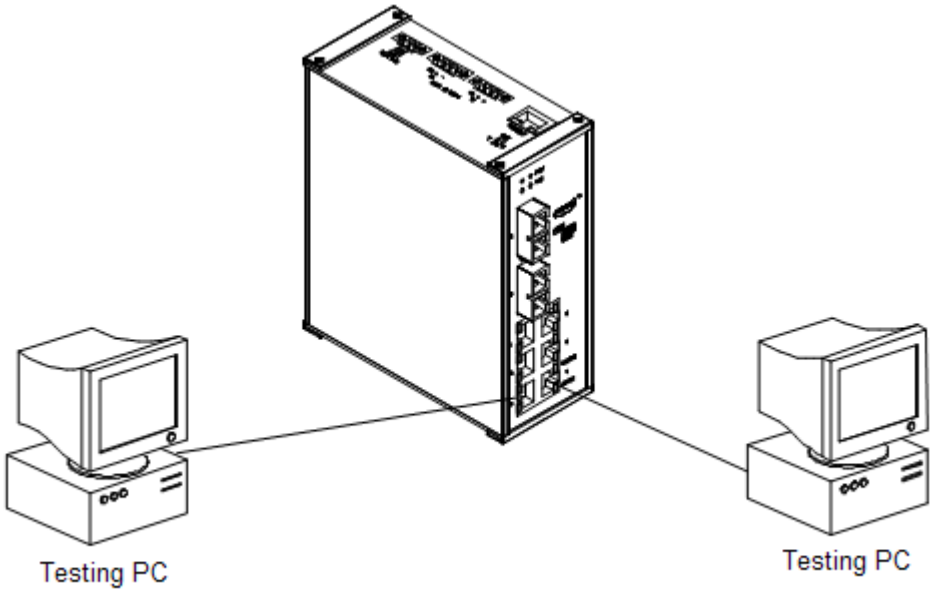


Fig. 5-1 Test TP portst

5.3 Test fiber port

Connect the two switches of KIEN6000 into chain optical network. Any one TP port of each switch is connected to PC by straight through cable and transmit PING command mutually, both sides can correctly Ping to each other and no data package is lost. Meanwhile, the corresponding LINK/ACT lamp is always on. All indicates that the tested fiber port hardware is no problem. The same method is used to test the other pair of fiber ports (For detailed operation of the Ping command, please refer to the following examples).

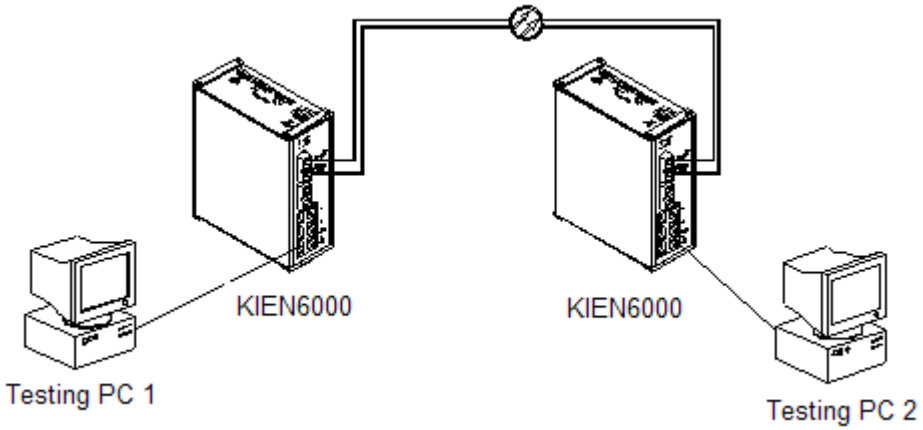


Figure 5-2 Test fiber ports

PING commands:

The IP address of testing PC 1 is 192.168.100.10, and PC 2 is 192.168.100.11,operate “cmd” or command (cmd in WIN2000 system, command in WIN98/95) in PC 1 and transmit “ping is 192.168.100.11 –l 1000 –t ”(–l means the number of byte, -t means continuously transmitting data), operate “cmd” or command (cmd in WIN2000 system, command in WIN98/95) in PC 1 and transmit “ping is 192.168.100.10 –l 1000 –t”. “Reply from 192.168.100.11：bytes=1000 time<10ms TTL=128” is replied by PC1 and “Reply from 192.168.100.10： bytes=1000 time<10ms TTL=128” by PC2. In more than 10 minutes, use “CTL+C” to count packet loss rate. If the packet loss rate is zero, the switch operates normally.

Chapter 6 Networking & Configurations

6.1 Networking mode

KIEN6000 offers 4 RJ45 ports of 10/100Base-TX, each of which can be connected to terminal devices directly or to another industrial Ethernet switch, hub as share. KIEN6000 also has 2 pair of uplink fiber ports of 100Base-FX, by which redundant optical ring network can be formed with recovery time less than 100ms. It is widely used electric power, transportation, energy, water treatment and factory automation etc.

The typical network topologies of KIEN6000 are redundant ring or double redundant ring network. KIEN6000 can be connected into redundant ring network as shown in Fig 6-1, one unit is local and the rest is remote. Any disconnection of the ring can be recovered within 100ms

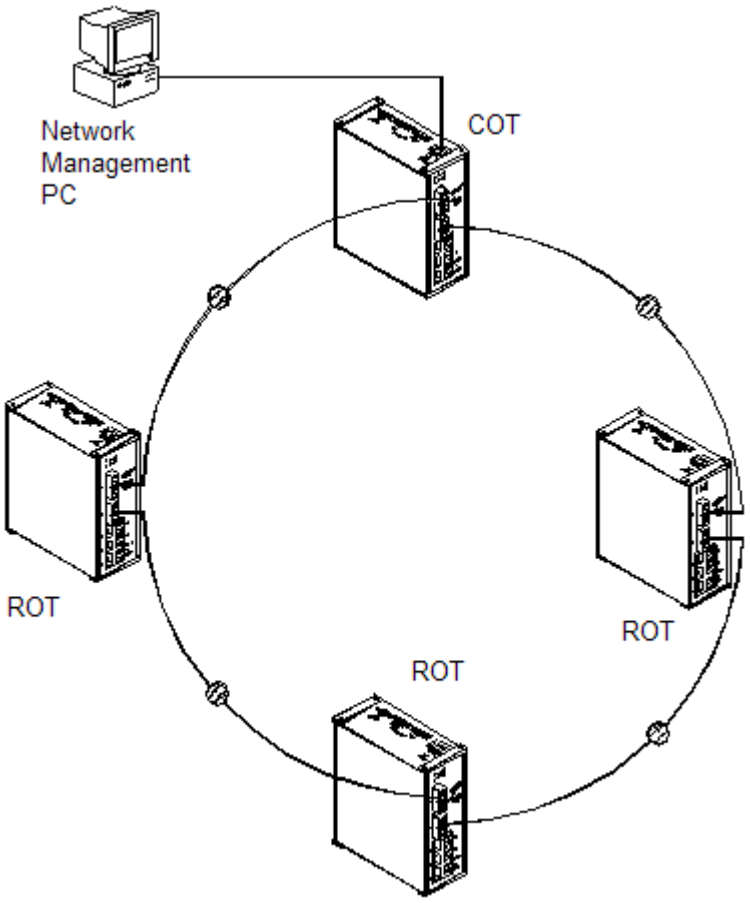


Figure 6-1 Redundant ring network

KIEN6000 can also used as shown in Fig 6-2, which is a double redundant ring network, any network failure can be recovered within 100ms.

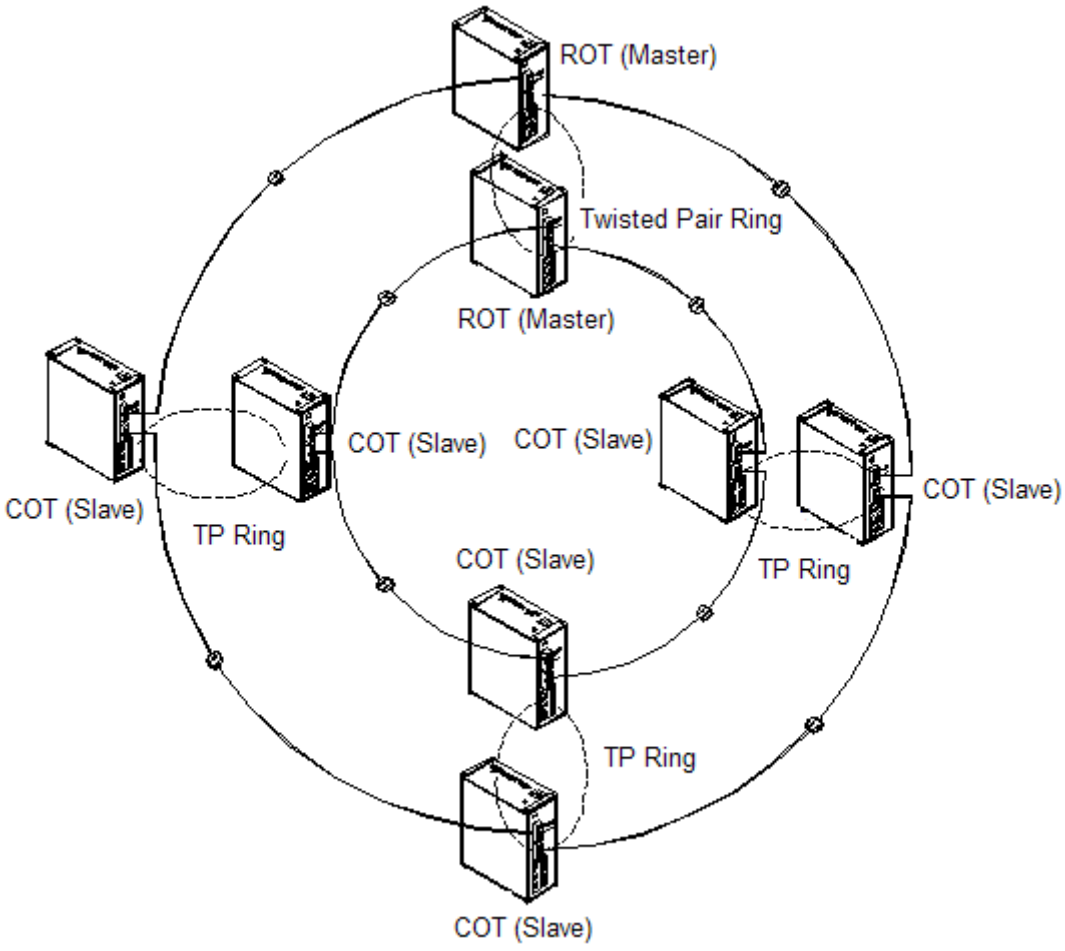
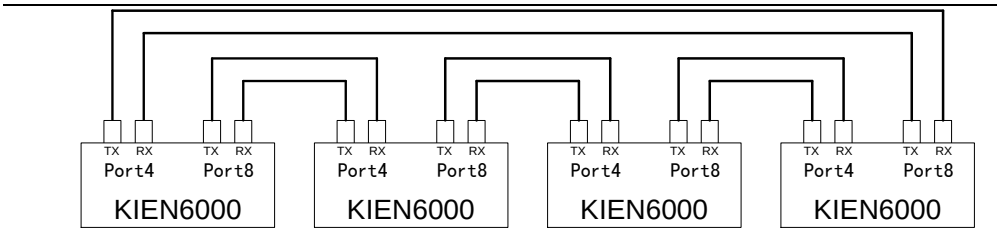


Figure 6-2 Double redundant ring network

Attention:

When KIEN6000 forms a redundant ring network, connection of fiber port 4 and 8 are recommended, namely, the fiber port 4 of one switch shall be connected with the fiber port 8 of another switch. This is shown as follows:



6.2 System configuration

KIEN5000 is an integrated structure, the 4 10Base-T/100Base-TX Ethernet RJ-45 ports, 2 uplink redundant 10Base-T/100Base-TX RJ45 ports and 2 pair of uplink 100Base-FX fiber ports are fixed configuration. The fiber port connector can be SC/FC/ST. The power supply voltage is 24VDC(18～36VDC). The optional power supply can be 12VDC(9～18VDC),48VDC(36～72VDC),110VDC(66～154VDC),220VAC(165～265VAC),220VDC(220～370VDC). The specific configuration and its corresponding models are shown as Table 6-1

Table 6-1 Configurations

Product Model	Product Description
KIEN6000-2S	2 pairs of uplink redundant 100Base-FX, single-mode 4 RJ45 ports of 10Base-T/100Base-TX 2uplink RJ45 ports of 10Base-T/100Base-TX
KIEN6000-2M	2 pairs of uplink redundant 100Base-FX, multi-mode 4 RJ45 ports of 10Base-T/100Base-TX 2 uplink RJ45 ports of 10Base-T/100Base-TX

Appendix A Twisted-pair and Pin Distribution

For the connection of 10Base-T/100Base-TX, the twisted-pair must have two pair cable. Each pair is distinguished with two different colors. For example, one strand is green, and the other is the alternate of green and white stripes. RJ-45 connector should be equipped at both ends of the cable.

Warning:

Don't insert a telephone plug into any RJ-45 port. Only use twisted-pair with RJ45 connectors at both ends conforming to FCC standard.

Figure A-1 Shows how the connector of RJ-45 is numbered please make sure that the inserting direction is correct.

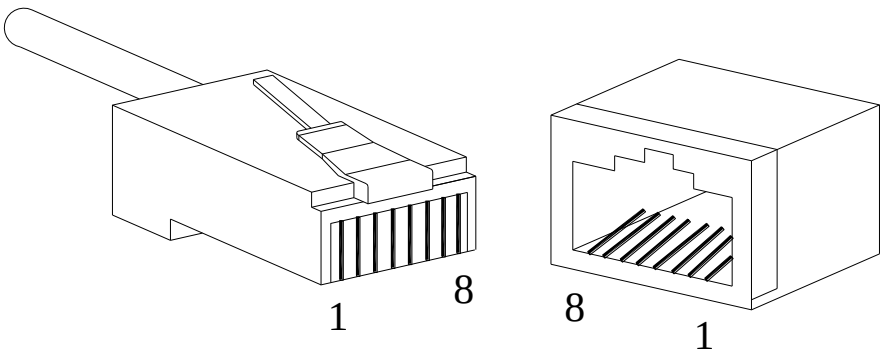


Figure A-1 Connector of RJ-45

Pin distribution of 10Base-T/100Base-TX

Unshielded twisted- pair (UTP) or shielded twisted-pair (STP) will be used for the connection of RJ-45: for the connection of 10Mbps, category 3, 4 and 5 of 100 ohm will be used, and cat.5 of 100 ohm will be used for 100Mbps. Additionally, do make sure that the connecting length of any twisted-pair shall not exceed 100 meter.

Port of RJ-45 supports automatic MDI/MDI-X operation, PC or server may be connected with straight-through cable, or connect with other switch or hub. In straight-through cable, pin 1, 2, 3 and 6 at one end of the cable are connected to pin 1, 2, 3 and 6 at the other end of the straight-through cable respectively. Cross-over cable must be used for switch or hub with MDI-X port. The pin distribution of 10Base-T/100Base-TX is listed in the table A-1.

Table A-1 Pin distribution of 10Base-T/100Base-TX

Pin	MDI-X signal name	MDI signal name
1	Receiving data ＋ (RD+)	Output data＋ (TD+)
2	Receiving data － (RD-)	Output data － (TD-)
3	Output data ＋ (TD+)	Receiving data＋ (RD+)
6	Output data－ (TD-)	Receiving data － (RD-)
4,5,7,8	Unused	Unused

Note: "+""-"denoting cable polarity.

Definition of straight-through cable from RJ45 (8-pin) to RJ45 (8-pin)

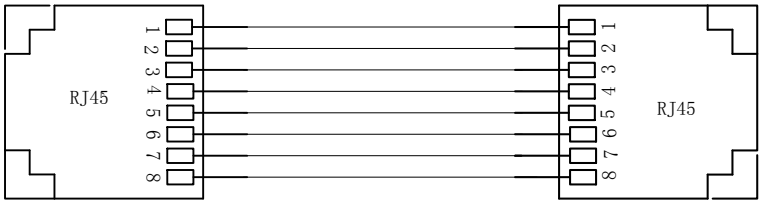


Figure A-2 Cable sequence of straight-through cable

Definition of Cross-over cable from RJ45 (8-pin) **to** RJ45 (8-pin)

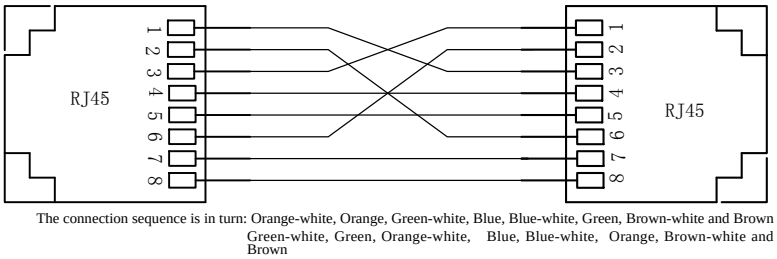


Figure A-3 Cable sequence of cross-over cable

Appendix B Cable Type and Specifications

The cable type and specifications are shown as table B-1:

Table B-1 Cable type and specifications

Cable	Type	Max. length	Connector
10Base-T	Cat.3, 4 and 5 100 ohm UTP	100m(328 foot)	RJ-45
100Base-TX	Cat.5 –100 ohm UTP	100m(328 foot)	RJ-45
100Base-FX	50/125 or 62.5/125μm core multi-mode fiber(MMF)	2km(1.24 mile)	SC/FC
100Base-FX	9/125μm core single-mode fiber(SMF)	20km(12.43 mile)	SC/FC

Appendix C Glossary

Terminology	Explanation
10Base-T	Twisted-pair standard of Cat3, Cat4 and Cat5 in IEEE specification for 10Mbps Ethernet
100Base-TX	Twisted-pair standard of Cat5 or above in IEEE specification for 100Mbps Fast Ethernet
100Base-FX	Fast Ethernet which uses one pair of multi-mode or single mode optical fiber to transmit.
Adaptive	A characteristic that is automatically configured to adaptive mode for the speed, duplex and traffic control port.
Bandwidth	The information capacity that the channel can transmit. For instance, the bandwidth of the Fast Ethernet is 100Mbps (bit per second).
Baud Rate	It expresses the signaling rate which is defined as the change times of the status for the electric or optical transmission medium within 1 second.
Bridge	One of network equipments which run on the layer2 in the OSI layer7 model, and it can be connected to the LAN or network segment which uses the same protocol. It presents the automatic network address learning and network configuration function.
Traffic Control	It is a congestion control mechanism. The network equipment sends the data to the equipment which has overloaded and causes the port to congest. The traffic control can prevent the data packet from loss and avoid the congestion for the port.
VLAN	It is the Virtual Local Area Network, which means that it takes the network management software to establish the point to point logic network which can cross different network segment and various networks on the switching LAN.
Broadcast	One data packet is sent to all equipments on the network.
Broadcast storm	Restless forward broadcast frame or multicast frame on bridge caused by the bridge ring.
IGMP	IGMP means Internet Group Multicast Protocol.
Full Duplex	Use switches to set up the point to point connection among nodes in the LAN and allow them to receive and send data packet at the same time.
Half Duplex	The communication for two nodes can only move toward one direction at the same time, but can not move toward both directions.

MDI	It is the Medium Dependent Interface, in which, one Ethernet port is taken as the receiving terminal to connect to the port of other equipment.
MDI-X	Medium Dependent Interface Cross-over